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Part I.—Original Articles.

PSYCHIATRIC ASPECTS OF THE POST-ENCEPHALITIC SYNDROME.

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THE present description is based on a study of 168 men and 107 women (total 275), who have been admitted to the Rampton State Institution diagnosed as post-encephalitic.

TABLE I.—Of the Two Sexes the Year of Onset is given as Follows.

	Males.	Females.
1908	1	—
1910	1	—
1911	—	1
1912	—	1
1915	1	—
1916	—	1
1917	4	—
1918	11	2
1919	7	5
1920	14	6
1921	15	5
1922	7	5
1923	17	16
1924	22	11
1925	16	8
1926	7	4
1927	4	1
1928	2	3
1929	1	1
1930	1	1
1931	—	3
1932	—	1
1933	1	1
	—	—
	132	76
Years not recorded	36	31
	—	—
	168	107

which shows that whereas the peak years for the onset of encephalitis lethargica were 1923 and 1924, the peak years for certification were the five years 1928-1932 inclusive, during which time 93 of the 168 males and 50 of the 107 female cases were certified.

The wide variety of channels through which these patients eventually find their way to Rampton is indicated by the following table:

TABLE V.—*Showing the Kinds of Previous Institutions (including Domiciliary) from which the Post-encephalitics have been Eventually Transferred (not counting Transfer to Similar Institutions in Individual Cases).*

	Males.	Females.
From Mental hospitals	23	21
„ Certified institutions	87	65
„ Public assistance institutions	32	25
„ Prisons	23	4
„ Police stations	3	—
„ Industrial schools	11	3
„ Reformatories	7	—
„ Borstal institutions	8	—
„ Broadmoor Criminal Lunatic Asylum	1	—
„ Residential schools	2	1
„ Approved schools	3	1
„ „ homes	1	1
„ Remand homes	2	—
„ Philanthropic social schools	1	—
„ Orphanages : Barnardo's	1	—
„ National Children's Home	1	—
„ Guardianship	6	3
„ Own homes	6	3
„ Winchmore Hill special hospital for post-encephalitics (L.C.C.)	6	2
„ Places of safety	4	2
„ Occupation centres (under the Central Council for Mental Welfare)	1	1
„ Special schools for M.D. children	1	3

From which it is seen that the main avenues for admission of the present series to Rampton are, in order of importance: (1) Certified institutions for mental defectives, (2) public assistance institutions, (3) mental hospitals, and (4) prisons. The small number of cases direct from home is also evident.

If we compare Table IV with the year of admission to Rampton (Table II), we see that from 1928 to 1932, 73 males and only 37 females were admitted, whereas in the 5-year period 1936-1940 the figures were 38 males and 37 females, which suggests (though no more is claimed for it) that the arrest of mental development is more protracted in females than in males, though it may also indicate that the foibles of the fair sex are tolerated much more readily than those of the male sex. This is borne out by Table V, which indicates that whereas 59 males passed through such "criminal" channels as prisons, Borstal institutions, industrial and approved schools, reformatories, etc., the corresponding number for females is only 10.

The physical effects of encephalitis are much greater in the males than in the females, but it also seems to be true—

(1) That the ratio of psychopathic cases of encephalitis in males and females

is roughly 3 : 2 (as compared with the average admission rate of approximately 9 males to 8 females).

(2) That the social consequences are more serious in the males than in the females.

The relationship to mental deficiency is indicated in Table VI.

TABLE VI.—*To Show the Degree of Mental Defect in Post-encephalitis.*

	Idiot grade. I.Q. 0-25%.	Imbecile grade. 25-50%.	Feeble-minded, 50-75%.	75-100%.	More than 100%.	Total.
Males	2	24	130	11	2	169
Females	0	18	82	5	2	107

Further information may be gained by studying the case material in terms of the relationship of mental deficiency to the age of the onset of encephalitis. Thus Table VII:

TABLE VII.

Males:

Age of onset before 5	Idiots, 2 Imbeciles, 13 Feeble-minded, 13 I.Q. more than 75, 1	29	132
Age of onset from 5-10	Idiots, 0 Imbeciles, 3 Feeble-minded, 39 I.Q. more than 75, 5	47	
Age of onset from 10-15	Idiots, 0 Imbeciles, 1 Feeble-minded, 34 I.Q. 75-100, 1 „ more than 100, 1	37	
Age of onset after 15	Idiots, 0 Imbeciles, 2 Feeble-minded, 14 I.Q. 75-100, 2 „ more than 100, 1	19	

Females:

Age of onset before 5	Idiots, 0 Imbeciles, 7 Feeble-minded, 12 I.Q. more than 75, 0	19	76
Age of onset from 5-10	Idiots, 0 Imbeciles, 2 Feeble-minded, 31 I.Q. 75-100, 1	34	
Age of onset from 10-15	Feeble-minded, 13 I.Q. 75-100, 2 „ more than 100, 2	17	
Age of onset after 15	Feeble-minded, 6	6	

It will be remembered that the M.D. Acts of 1927 modified the previous Act of 1913, to make possible the certification of post-encephalitics as mental defectives, by defining mental defect as a state of arrested mental development occurring before the age of 18 years. That mental development is retarded there can be little doubt, in spite of the occurrence of exceptional cases showing more than average intelligence. It is also evident that the earlier the disease

makes its appearance, the more likely and profoundly is intellectual impairment to arise. Thus the proportion of the lowest grades is more marked in the "before 5" groups than subsequently, even though the incidence of psychopathic encephalitis is greater in the 5-10 groups than in the others, though it must be remembered that our series does not in general take account of encephalitis occurring after the age of 18. If, however, we review the age of onset for each year, it will be seen that a small group have actually developed encephalitis after the age of 18, though certification under the M.D. Acts was possible by virtue of evidence of mental defect existing prior to the occurrence of encephalitis.

TABLE VIII.—*Showing the Age of Onset of Encephalitis.*

	0-1.	1-2.	2-3.	3-4.	4-5.	5-6.	6-7.	7-8.	8-9.	9-10.
Males . . .	11	4	4	3	3	9	8	14	6	14
Females . . .	3	0	2	7	7	5	7	6	6	8

	10-11.	11-12.	12-13.	13-14.	14-15.	15-16.	16-17.	17-18.	18	Total.
Males . . .	5	4	12	9	8	3	8	5	2	132
Females . . .	5	1	4	2	8	1	3	0	1	76

It is quite evident from our series that mental defectives are no more immune to encephalitis than any other section of the community.

Thus 14 males and 7 females had been notified as showing abnormal tendencies, with or without mental defect, before the onset of encephalitis. These were made up of the following cases :

Males.

(1) Noted as defective from an early age, but having had an attack of encephalitis at 11.

(2) Noted as defective from an early age, but having an attack of encephalitis at 22.

(3) Noted as defective from an early age but with no history of an attack of acute encephalitis, but diagnosed as a post-encephalitic at 23.

(4) Ditto, but diagnosed as a post-encephalitic at 30.

(5) Noted as backward, not walking till 5, but contracting encephalitis at 10.

(6) Noted as defective at 2, but contracting "meningitis" at 7. This man is a very definite post-encephalitic with obvious Parkinsonism.

(7) Noted as "vicious and wandering" at 4, and having encephalitis at 5.

(8) Diagnosed as defective at 10, having a severe head injury at 14, and at 31 noted as being a definite Parkinsonian post-encephalitic.

(9) Had an attack of encephalitis at 13, but noted as defective from an early age.

(10) Had an attack of encephalitis at 17, but noted as defective previously.

(11) Had encephalitis at 13, but was impulsive and destructive previously.

(12) Noted as having criminal tendencies at 7, and encephalitis at 13.

(13) Noted as dull and backward previous to encephalitis at 12.

(14) Noted as having an uncontrollable temper in 1914 and having encephalitis in 1923.

Females.

- (1) Had encephalitis at 6, but was noted as defective previously.
- (2) Was difficult from birth, but was diagnosed as a post-encephalitic at 19.
- (3) Was said to be defective from injury at birth, but on admission at Rampton at 20 was suffering from severe Parkinsonism.
- (4) Was noted as defective from an early age, having had convulsions at 3 months, which were attributed to difficult delivery at birth, and being diagnosed as a post-encephalitic at 20, with multiple tics and involuntary movements.
- (5) Was at a special school for defectives, and contracted encephalitis at 13.
- (6) Was noted as defective from birth, and excluded from school, but on admission at 8 was diagnosed as a post-encephalitic.
- (7) Was noted as defective at 7, and had encephalitis at 8.

Examination of the case material shows :

- (1) Encephalitis certainly produces severe retardation of intellectual development.
- (2) Mental defectiveness in itself may be a precursor of encephalitis, and though it might be hazardous to suggest any causal relationship between the two states, yet the possibility might be borne in mind.
- (3) Encephalitis may not only produce arrest of mental development, but also predisposes to marked mental deterioration in certain cases. Cases which illustrate this are the following :

(a) One male whose mental age was assessed at 11 years in 1928, but who seven years later was estimated at less than 8.

(b) A patient whose I.Q. fell from 82 to 70 in three years.

(c) A male patient whose mental age was assessed at 13 in 1940, which had fallen to 11 years 3 months three years later.

(d) A male patient whose mental age at 20, three years after an attack of encephalitis, was assessed at $12\frac{1}{2}$, seventeen years later was assessed at 10 years 3 months.

(e) A male patient whose mental age by Terman tests was assessed at 16, ten years after an attack of encephalitis, but who twelve years later was assessed at 10 years and 5 months.

(4) In spite of severe mental retardation in certain cases, some recuperation is possible, though this probably applies only to a minority of cases. The following cases exemplify this :

(a) The case of a man who was diagnosed as an imbecile in 1937 following encephalitis, but whose mental age in 1943 was assessed at 14, and who was regarded by the other patients as someone rather superior in intelligence as compared with the rest. He was also sufficiently recovered to allow of his transfer to a certified institution.

(b) The case of a man who had encephalitis at 11, but who had sufficiently recovered to allow him to graduate with an Arts degree.

(c) The case of a man who had encephalitis at 13, was only able to reach standard 4 at school, and by tests was assessed at a mental age of less than 10, but who wrote a play called "The Pride of Rome," which was sufficiently complete to have been capable of production on the stage.

(d) The case of a boy of 10 who had encephalitis at 5, and was assessed by tests as having a mental age of 6, though a year later this was assessed at 8 years 11 months, and by the Porteus maze test at 10.

(e) The case of a girl who had encephalitis at 5, with a later history of fire-raising

and stealing, whose mental age was assessed by Binet tests as $10\frac{1}{2}$ at 28, and who later recovered so that her mental age at 31 was assessed at 14 years 2 months.

(f) The case of a girl who developed encephalitis at 18, whose mental age five years after after a spell of very marked immorality was assessed at 12 years, was found on re-testing at 28 to be 17 years 2 months, with an I.Q. of 114.

(g) The case of a girl who had encephalitis at 3, was diagnosed as an imbecile at 10, reported as having a mental age of 9 at 27, and a mental age of 12 years 3 months at 30, with an I.Q. of 82 per cent. by Terman-Merrill tests.

It is advisable to remember the wide variations liable to occur in testing by different workers, though the grading and direction given with the tests is standardized as much as possible. It is only fair to point out, however, that in the present series different workers have assessed the mental ages at different periods, but only figures have been quoted which confirmed the clinical impression of improvement or deterioration, and for the most part at any rate they represent substantial alterations in either an adverse or favourable direction.

In view of what has just been said, it will be realized that the scope of assessment depends upon five important factors :

- (1) The level of intelligence attained before the onset of encephalitis.
- (2) Related closely to this is the age at which the encephalitis occurred.
- (3) The element of psychopathy considerably alters the form of score, with marked scattering in some cases ; thus in one case with complete success up to 9, complete failure did not occur till the tests for Superior Adult 1, though the final mental age was only 11 years 7 months ; in another case failure began at the tests for 9 with partial successes up to Superior Adult 1, giving a mental age of 12 years 3 months. Failures in performance tests and memory defects, especially for recollecting details of facts and repetition of numbers, are also found.

- (4) In addition to this more or less specific effect of psychopathy there is also the deeper underlying factor of retardation from depression with its accompanying slowing of all intellectual processes. The law of reversed effort also operates, for the post-encephalitic does not like feeling beaten, and tries hard, but usually in vain, to come out well in the tests. In the more manic phases, there may be a certain facility in the tests which is offset by distractibility and irrelevant interruptions. Others will argue with great vigour that the form of the tests is wrong, and spend considerable time, if allowed, to indicate how they should be presented. In the Otis group tests the most constant item of failure is in the similarities test, though the other tests show fairly wide variation in failures. In general the post-encephalitic rather enjoys mental tests, and his keenness is probably better brought out in group tests than in the individual ones. He feels that he is competing with his equals and the possibility of success fascinates. This, I think, is a partial explanation of his great interest in conundrums, which appear to provide him with considerable interest and amusement.

- (5) The degree of restoration obtained when the active process of deterioration has abated.

The Goodenough test, which is based on the ability to draw the figure of a man, is frequently recommended for assessing the mental age of defectiveness. As a test it has a very restricted sphere of usefulness, if for no other reason than

that it depends upon drawing ability, which is quite a special manifestation of intelligence. In comparison with more representative tests it also tends to give a much lower assessment in general. Thus in 100 post-encephalitics the results were as follows:

Mental age less than 3 .. 6 on points :				less than 3 .. 6			
3 and	"	4 .. 3		3 and	"	5 .. 2	
4 "	"	5 .. 3		5 "	"	7 .. 3	
5 "	"	6 .. 17		7 "	"	9 .. 7	
6 "	"	7 .. 26		9 "	"	11 .. 9	
7 "	"	8 .. 21		11 "	"	13 .. 12	
8 "	"	9 .. 17		13 "	"	15 .. 14	
9 "	"	10 .. 3		15 "	"	17 .. 12	
10 "	"	11 .. 4		17 "	"	19 .. 10	
		—		19 "	"	21 .. 10	
Total	..	..100		21 "	"	23 .. 8	
				23 "	"	25 .. —	
				25 "	"	27 .. 2	
				27 "	"	29 .. 4	
				29 ..	..	.. 1	
				Total	..	..100	

Head measurements for 100 male encephalitics, as compared with general male hospital population, give the following figures:

(a) *Longitudinal* (head length).

Post-encephalitic :

17·8-18 cm.	6
18·1-18·5 cm.	15
18·6-19 cm.	41
19·1-19·5 cm.	23
19·6-20 cm.	11
20·1-20·5 cm.	3
20·6-21 cm.	0
21·1-21·5 cm.	0
21·6-22 cm.	1
	100

Average population.

1	17-17·5 cm.
4	17·6-18 cm.
22	18·1-18·5 cm.
25	18·6-19 cm.
32	19·1-19·5 cm.
12	19·6-20 cm.
3	20·1-20·5 cm.
1	20·6-21 cm.
0	21·1-21·5 cm.
0	21·6-22 cm.
	100

An average of 19·03 cm. as compared with 19·004 cm. for the general population:

(b) *Transverse* (head breadth).

Post encephalitic :

13·5-13·6 cm.	0
13·7-13·8 cm.	1
13·9-14 cm.	2
14·1-14·2 cm.	5
14·3-14·4 cm.	4
14·5-14·6 cm.	16
14·7-14·8 cm.	9
14·9-15 cm.	17
15·1-15·2 cm.	5
15·3-15·4 cm.	10
15·5-15·6 cm.	21
15·7-15·8 cm.	2
15·9-16 cm.	4
16·1-16·2 cm.	2
16·3-16·4 cm.	1
16·5-16·6 cm.	0
16·7-16·8 cm.	1
	100

Average population :

4	13·5-13·6 cm.
4	13·7-13·8 cm.
7	13·9-14 cm.
14	14·1-14·2 cm.
15	14·3-14·4 cm.
14	14·5-14·6 cm.
12	14·7-14·8 cm.
14	14·9-15 cm.
6	15·1-15·2 cm.
5	15·3-15·4 cm.
3	15·5-15·6 cm.
1	15·7-15·8 cm.
1	15·9-16 cm.
0	16·1-16·2 cm.
0	16·3-16·4 cm.
0	16·5-16·6 cm.
0	16·7-16·8 cm.
	100

An average of 15.07 for the post-encephalitic group as against an average of 14.66 for the general hospital male population:

- (c) *Cephalic index*. This is obtained by dividing the head breadth by head length and multiplying by 100. The figures for this are:

Post-encephalitics:			General hospital male population:		
69.1-70	.	1	1	.	69.1-70
70.1-71	.	1	2	.	70.1-71
71.1-72	.	0	3	.	71.1-72
72.1-73	.	2	5	.	72.1-73
73.1-74	.	0	10	.	73.1-74
74.1-75	.	7	12	.	74.1-75
75.1-76	.	9	13	.	75.1-76
76.1-77	.	6	10	.	76.1-77
77.1-78	.	9	13	.	77.1-78
78.1-79	.	15	8	.	78.1-79
79.1-80	.	18	10	.	79.1-80
80.1-81	.	6	5	.	80.1-81
81.1-82	.	10	6	.	81.1-82
82.1-83	.	3	2	.	82.1-83
83.1-84	.	4	0	.	83.1-84
84.1-85	.	1	0	.	84.1-85
85.1-86	.	3	0	.	85.1-86
86.1-87	.	2	0	.	86.1-87
87.1-88	.	1	0	.	87.1-88
88.1-89	.	2	0	.	88.1-89
100			100		

An average of 79.23 per cent. for the post-encephalitic group as compared with 76.1 per cent. for the general hospital male population group:

- (d) *Cephalic circumference*.—The comparative figures for these are:

Post-encephalitics:			General hospital population:		
51.1-52 cm.	.	0	.	.	4
52.1-53 cm.	.	3	.	.	5
53.1-54 cm.	.	14	.	.	19
54.1-55 cm.	.	19	.	.	23
55.1-56 cm.	.	33	.	.	29
56.1-57 cm.	.	21	.	.	13
57.1-58 cm.	.	3	.	.	6
58.1-59 cm.	.	4	.	.	1
59.1-60 cm.	.	2	.	.	0
60.1-61 cm.	.	0	.	.	0
61.1-62 cm.	.	1	.	.	0
100			100		

An average of 55.4 cm. (21.88 in.) for the post-encephalitic group as compared with 54.04 cm. for the general hospital male population group.

In general it appears that head length tends to be shorter, as judged by the main concentration of the group in the ranges less than 19 cm., as compared with that for the controls in the 19.1-19.5 cm. range.

There was one post-encephalitic with hydrocephalus in the 21.6-22 cm. range, which brought up the average considerably.

Along with this relative diminution of head length, there was in the post-encephalitic group a much more uneven distribution curve for head breadth with a definite tendency to concentration in the higher ranges, with the maxi-

imum number of 21 in the 15.5-15.6 cm. range, and for the general hospital population to be concentrated in the less than 15 cm. range.

This difference is confirmed by the figures for the cephalic index, which shows a greater concentration in the higher ranges than for the lower, in contrast to the figures for the general population. The figures for the cephalic circumference show a slightly greater concentration in the higher ranges with a higher average in the post-encephalitic group. The only suggestions I have to offer for this comparatively greater breadth of head, cephalic index and circumference is that some slight degree of hydrocephalus may be more common than we recognize, and also that at post-mortem some of the cases have hypertrophy of the skull, especially of the parietal bones. It is, of course, possible that the decrease in head length could be explained as a consequence of arrested cerebral development. The fact that the distribution curve shows some irregularity for cephalic breadth and index certainly points either to a lack of uniformity in cause, or to multiple factors.

INSANITY AND THE POST-ENCEPHALITIC STATE.

Doctors who have worked in both mental hospitals and mental deficiency institutions have said that the post-encephalitics of both institutions present little difference in their characteristics, but there is no doubt that there are individual differences between different cases, so that some present more psychotic symptoms than others. The Rampton series represents an intermediate group in which there are indications of mental defectiveness along with violent and dangerous propensities which may or may not have a markedly psychotic colouring, though in them all there are indications that they have passed from a state of mere backwardness to a state of psychopathy. The psychopathic effects can be dealt with separately, but our immediate purpose is to review their symptoms from the more strictly psychotic aspect.

The data of insanity may be reduced to the following main categories :

(1) Confusion.

(2) Emotional imbalance, either by hypofunction (schizoid) or by hyperfunction (hyperaesthesia), which may be fitful, too pessimistic (depression) or too optimistic (mania).

(3) Hallucination.

(4) Delusion.

(5) Dementia.

If we apply these to the data of the present cases we see that their relative distribution is as follows :

	Males.		Females.
(1) Confusion	60 (35.71%)	.	42 (39.25%)
(2) Emotional imbalance :			
(a) Schizoid	75 (44.64%)	.	24 (22.42%)
(b) Cycloid	89 (52.98%)	.	38 (35.51%)
(c) Epileptoid	32 (19.05%)	.	10 (9.35%)
(d) Manic	60 (35.71%)	.	31 (28.97%)
(e) Depressive	67 (39.88%)	.	31 (28.97%)
(3) Hallucination	8 (4.76%)	.	8 (7.48%)
(4) Delusion	42 (25.00%)	.	13 (12.15%)
(5) Dementia	34 (20.24%)	.	13 (12.15%)

The phases of confusion appear to be related to insecurity feelings connected with some breakdown in the parent-child relationship. This is exemplified by the following correlations of 57 males and 33 females showing confusional episodes in the suggested connotation. Lack of information explains the brevity of the notes offered here, and also why I am unable to say anything about the remaining 3 males and 9 females.

- | | |
|---|--|
| 1. No mother | Wandered away frequently. |
| 2. Brought up by grandparents, both over 70. Father often out of work | Used to hide himself away. Made 16 efforts at absconding. |
| 3. Mother very unstable, health very poor. Father unemployed. Parents unable to control the child. Mother died in 1942 | Went away from home for long periods. Memory poor. Threatened suicide on hearing of mother's death. |
| 4. Brought up in poor cottage. Father earned 36s. a week; one of 4 children | Confusion. Indecent exposure to females. Silent and stuporose. |
| 5. Youngest of 12 | Wanders. Hid in a ship. Absconded 4 times in one year. Arrested for travelling with no ticket. Stole a cycle on 3 different occasions. |
| 6. Parents of poor mentality. 14 people shared 3 bedrooms in a dirty house. Grandparents lived with them. Mother married one week before patient born | Wanders. Enters and damages property. |
| 7. Parents had no control of the patient | Stayed out all night. Absconded many times. Got out of a window 30 ft. high. Attacks of confusion. Had 15 situations in 2 years. |
| 8. Mother defective. Father alcoholic and immoral | Attacks of confusion. Two attempts at absconding. Used to hide behind the bushes for purposes of masturbation. Sleeps excessively. |
| 9. Mother a hopeless nervous invalid. Father a rag and bone labourer. Patient one of 6 children alive. Lived in a slum with 2 bedrooms | Periodic attacks about once a month with violence, followed by exhaustion. Often ran away from home. Absconded. |
| 10. Father was an M.D. brought up at a C.I. | Wanders at night. No concentration. Dull and vacant. |
| 11. Father on compensation. Mother not strong. Poor home. 2 bedrooms for parents and 5 children | Poor concentration. Truant from school. Wanders on buses. |
| 12. Father neurasthenic. Father and mother and 5 children share 2 bedrooms | Wanders. Tries to escape from home and school. |
| 13. Spoilt by mother, who was mentally dull and nervous. Jealous of twin sisters. Overcrowded house | Boards trains. Absconds. Roof climber. Truant. Noctambulist. |
| 14. Brought up by stepmother | No concentration. Lies about anywhere. Dull and apathetic. |
| 15. Says he has no home and no relatives | Stole 2 cycles. Tramped the country. Confused. |
| 16. Father was alcoholic and syphilitic. Mother in bad health | Absconded 15 times. Roof climber and hid in the roof. |
| 17. Parents separated and alcoholic. Father neglectful. Mother's whereabouts unknown | Convictions for wandering. Truant. |
| 18. Father on the dole. Lived in poor locality. One of 5 children | Can't concentrate. Memory defective. Absconded frequently. Convicted for being in a house for unlawful purpose and stealing. |

- | | |
|--|--|
| 19. Brought up in London slum . . . | Convictions for begging, vagrancy and stealing. Had many different employments. Convulsive seizures. |
| 20. Father out of work for 2 years. Brought up in a poor home | Convicted for vagrancy and sexual assault. Stole a cycle. Had many different employments. Wanders. |
| 21. Mother died in fatal accident . . . | Frequently absconded. |
| 22. Father dead. Brought up in London slum | Wanders. Dull and disoriented. |
| 23. Mother an invalid and nearly blind . | Vicious and wandering from the age of 4. Developed encephalitis at 5. |
| 24. Father away at sea in the Navy. Mother very anxious | Restless, inattentive, wanders. Gets out of windows at night. Absconds. |
| 25. Both parents dead. Brought up by sister | Absconded. Runs away. Tramps and sleeps out. |
| 26. Illegitimate. Mother later deserted her husband and went to Canada. Brought up by grandmother and an aunt. Later went to Canada but was sent back home | Absconded 25 times, vagrant. "Neglected and without visible means of support." Ran off with ponies, pigs, chickens, scooters and cycles. Fugue-like states. No recollection of what he has done when he absconds. Falls asleep standing up. Very sleepy periods. |
| 27. Father killed in last war. Brought up by stepfather. Illegitimate | Wanders into houses. Holds cars up. Poor concentration. Stuporose attacks. |
| 28. Born in Canada. An only child. Brought up by stepfather. Mother very nervous | Dull. Lethargic. Absconder. Very sleepy in daytime. Kisses older men. Before the court for being "beyond control." |
| 29. Father in a mental hospital . . . | Wanders. Stole a cycle. Beggar. Absconder. |
| 30. Father a casual labourer . . . | Absconder. Hid in coal bunker and slept there. Somnolence in daytime. Awake at night. |
| 31. Illegitimate. Stepfather man of queer, violent temper. Mother subnormal. Brought up by grandmother | Sleeps in the daytime. Awake at night. Can't concentrate. Tries to climb fences. |
| 32. Father on night-work . . . | Wandered on enclosed premises. Used to have fainting attacks. |
| 33. Father a man of violent temper; epileptic history | Charged with wandering with no visible means of support. Cataplectic attacks. Says he lives a cotton-wool existence and that he sees life as through a thick veil. |
| 34. Mother died when he was 2. Brought up in a poor home . . . | Can't concentrate. Epileptoid attacks. Restless in the night. Sleepy in the daytime. Confusional attacks. |
| 35. Brought up by stepfather, who was often out of work | Left home for a few weeks without saying where he was going. Tried to abscond. Vaso-vagal attacks. |
| 36. Mother dead . . . | Absconder. Restless. Wanderer. Hides himself. Fainting attacks. |
| 37. Father a widower. Brought up in a poor home | Wanderer. Tried to sleep in bed with clothes on. Absconded 3 times. Stole a motor cycle. |
| 38. Father reduced in circumstances. Was a twin—but the other one died | Stole cycles. Truant. Wandered from home. Sullen and liable to fits of drowsiness and temper. Dull and heavy. 14 situations in 6 months. |
| 39. Brought up in a poor locality. Sister at a C.I. Father dead. Mother's whereabouts unknown | Wanders. Truant. Absconds. |

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| 40. Father often out of work. Brought up by grandmother | Absconded 8 times. Ran away from home—wandered on the railway line, and into rivers. Stole a cycle. Climber. |
| 41. Comes from a poor home; lacking in control | Charged with "being beyond control." Wanders. Absconded in his shirt. Epileptic. |
| 42. Mother very difficult woman, who made trouble with neighbours. Working-class family | Acute confusional attack with delirium. Disordered sleep with excitement at night. Beggar. Absconder. |
| 43. Mother deserted father, who lived with another woman, and was out of work. Home conditions poor. Two other children out of control and at special schools | Convicted for wandering. Restless. Absconder. |
| 44. Mother dead | Disorientation for time and place. Drops off to sleep when interviewed. |
| 45. Brought up in a poor locality, and in a very overcrowded house | Wanders aimlessly. Cataplectic. Confusional attacks. |
| 46. Father died of cancer; had been prosecuted for poaching and shop-lifting. Mother was feeble-minded | Stole a cycle. Truant. Absconded. Wandered. Rode through the Severn tunnel on the buffer of a petrol truck. Vacant expression. Slept at school. |
| 47. Brought up by grandmother | Wandered into houses, etc. Restless. Tried to abscond. |
| 48. Parents of low mentality. Mother a terror to the village | Slept out at night. Absconds. |
| 49. Mother dead | Vacant expression. Falls asleep in the daytime. Wanders. Absconded 6 times. Beggar. Hides in the bushes. Wandered. Tried to abscond. |
| 50. Father a casual labourer. Brought up in a London slum | |
| 51. Father died of tubercle | Attacks of confusion. Epileptic and fainting attacks. Absconded 5 times. Stole a cycle. |
| 52. Mother alcoholic and separated from father | Attacks of fainting; unconsciousness lasts 5 minutes. Very heavy sleeper. Stole a cycle 5 times. Truant from school. Absconder. Sullen and moody. |
| 53. 8th of 9 children. Father on pension, suffering from shell-shock and malaria | Attacks of vacancy, wandering and absconding. Stole 2 cars. Was found starving in a hut that he had built from stolen property. Broke into a shop at night. |
| 54. Has a mother, whom he has twice tried to strangle, and also a step-father | Always truanting. Absconder. History of epilepsy. |
| 55. Mother died when he was 10. Brought up by grandparents and an uncle and an aunt in an overcrowded house in a slum area | Is inattentive, restless. Stayed out late at night. Aimless. |
| 56. Mother dead; was one of 9 children. Father died when he was 22 | Wanders. Moves about at night. Restless. |
| 57. Mother died in a mental hospital | Wanderer. Frequent absconder. Hides himself. |

Other factors which appear to be important, though not specifically mentioned above, are the number of occasions in which the stealing of vehicles is an important episode in the wandering state, and also the number of occasions where sexual assaults, rape, indecent exposure and homosexual adventures appear to be the *dénouement* of the wandering phase. In many cases there is a history

of exposure to mother or sisters, or of other instances of a show of affection which has been misplaced.

Females.

1. Mother a widow. Father killed in the war. One of 7 children. Youngest 2 illegitimate by different fathers. Two bedrooms for whole family Attacks of confusion. Tried to run away.
2. Father in Bermuda; a soldier in India in 1925. Was in India from 4-11. Mother tubercular "Found neglected." Absconded from service while on licence. Tried to run away from institutions. Said to be epileptic as a child. Had an illegitimate child.
3. Brought up in a poor home. One of 8 children; only 2 bedrooms. Father out of work. Both parents show stigmata Ran away whenever possible.
4. Mother dead Wanders aimlessly.
5. Parents divorced. Was born in Canada; father very cruel. Has an illegitimate sister Sudden attacks of violence, then goes vacant. Ran in front of traffic to stop it. Walks in her sleep.
6. Mother a widow, with a large family. Brother in a home Confusional attacks. Cannot concentrate. Somnolent in the daytime. Attacks of *petit mal*.
7. Ill-treatment to mother in pregnancy by father Absconder. Excessive somnolence.
8. Mother ill in pregnancy. Brought up by stepmother Ran away with no shoes on.
9. Illegitimate. Brought up by step-father Wandered on the railway line. Lay down in the road. Entered cars and tried to start them. Shut herself up in a bread van and rode for 8 miles. Somnolent in the daytime.
10. Father cruel and alcoholic Absconder. Restless.
11. An orphan. No home Wanderer. Absconder. Attacks of fainting.
12. Parents unknown. No home. Brought up at a foundling school Attacks of stupor. Restless. Roof climber. Cannot concentrate.
13. Mother of low mentality Dull at intervals. Mind wanders.
14. Mother a widow and alcoholic. Youngest of 9 children Ran away to London from Newcastle. Attacks in which she falls to the ground limp and helpless. Attacks of drowsiness.
15. Both parents dead. Youngest of 5 Convicted for wandering abroad. Came from Glasgow, but found in London. Had an illegitimate child at 17. Attacks of drowsiness.
16. Lived with 3 grandparents. Brought up by stepfather Restless. Easily distracted. Enters other people's houses and cars and refuses to leave. Kissed and scratched her brother. Wandered for miles.
17. Father out of work. Mother suffering from pre-senile dementia. House badly kept Lacks concentration. Wanders, following street organs or music. Attacks of fainting and stupor.
18. Father nervous after the last war No memory for recent events. Restless at night. Wanders. Sleeps all day.
19. Father suffered from shell-shock. Alcoholic. Parents divorced Restless. Absconder. Beggar. Immoral from 15.
20. Father charged with drunkenness. Youngest of 5 alive Restless. Cannot concentrate. Ran away from school.

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| 21. Father dead. Brought up in Liverpool slum | Goes from home without clothes. Accosts men. Confusional attacks. |
| 22. Father deserted mother | Runs away from home. Romances and detached from reality. |
| 23. Illegitimate. Stepfather out of work. Brought up by grandmother | Wanders. Behaves indecently to boys. |
| 24. Mother immoral. Has an illegitimate sister | Screams at night. Wanders irresponsibly. Runs after men and asks for money. Climbed fire escape. |
| 25. Father suffering from shell-shock and neurasthenia. Grandmother lives with family. Poor home | Restless. Runs aimlessly on the road. |
| 26. Father very nervous. Brought up in poor home | Attacks of confusion and dissociation with amnesia. Walks around the room and undresses herself. Inversions of sleep rhythm. Caresses and bites. Tried to abscond. Stole a cycle. |
| 27. Brought up in a one-roomed house. Mother separated from father | Inattentive, restless, confused. |
| 28. Father alcoholic and out of work. Mother had 10 children and one miscarriage | Wanders off and sleeps out with sailors. Truant. |
| 29. Mother epileptic. Had many convictions against her. Abusive and bad example | Unable to concentrate. Absconded many times. Dissociation. Had one illegitimate pregnancy. Father unknown. |
| 30. Illegitimate | Forgetful. |
| 31. Mother died when 2. Father dead. Brought up by stepmother | Attention wanders. One illegitimate child. Attacks of somnolence in daytime. Absconder. |
| 32. Brought up in a slum. Illegitimate. Has a stepfather | Wandered away from home. Absconder. Frequent employments. Out late at night with men. Had an illegitimate child. |
| 33. Mother mentally unbalanced. A widow | Slow, lethargic. Somnolent in daytime. Absconder. Opens windows to get out. Confusional attacks. Hides herself. |

In the other cases there is no information available, but it appears very evident that the patient's own sense of insecurity is related to the insecurity of his own family life. In this connection the ambivalent reactions of love and hate make their appearance, showing themselves where caressing and tenderness suddenly give place to biting and other forms of violence.

The association of confusional attacks with phases of wandering is also worth noting.

"Whoever introverts libido—that is to say, whoever takes it away from a real object without putting into its place a real compensation, is overtaken by the inevitable results of introversion. The libido, which is turned inward into the subject, awakens again from among the sleeping remembrances one which contains the path upon which the libido once had come to the real object. At the very first and in foremost position it was father and mother who were the objects of the childish love" (Jung, *Psychology of the Unconscious*, p. 53).

This statement from Jung appears to me to be the inverse of what obtains in many of the post-encephalitics, and in its present form has little or no

application to them, but if objectively there is a breakdown in the parent-child relationship from the parent's side, libido becomes misdirected, and eventually extraverted to an abnormal degree, so that the lack of security may find some sort of compensation in the external world, which takes the form of a number of possible alternatives. These are initially confusion, wandering of mind, loss of the power of concentration, abstraction, memory failure, but passing over into fugue-like states, wandering, vagrancy, truancy, running away from home, absconding, inversion of the sleep-walking rhythm, noctambulism or somnambulism and emotional imbalance which may either be schizoid in form or cycloid with epileptoid, manic (or hypomanic) and depressive forms.

The post-encephalitic suffers from an inability to relate his libidinous trends to a suitable external object, and as a result he suffers from a lack of emotional balance which may be schizoid, or cycloid in form, with the resulting possibilities of epileptoid, manic or depressive phases.

The use of these terms calls for a little further description by way of definition, for the usual Kretschmerian classification is hardly applicable to the type of case that we are here considering. The majority of them can, however, be safely described as "affectively lame," and numbers of them exhibit psychaesthetic disproportion which, according to Kretschmer, is typical of the schizoid temperament.

The underlying paradox of psychiatric classification is abundantly illustrated by the cyclothymic phases of the catatonic (Gjessing syndrome) and the intense introversion (schizoid) of the depressed person. Nor are we any better served by such simple divisions as introvert and extravert. The reactions are more complicated than these simple divisions suggest, and it is rather as though we observe a certain patient pass through a number of emotional evolutions, and say that this reaction is schizoid and that one cycloid. For our present purpose we have studied the series of cases with the following definitions in mind:

(1) By "schizoid" we include such traits as autism, negativism, aloofness, detachment, manneristic conduct, solitariness, resistiveness (usually with impulsive phases), apathy and inanity; we also include such phases as those in which there is a breakdown of the thought processes resulting in word-salad, echolalia and verbigeration.

In a few there are states analogous to those found in catatonia, but many of these are included for the present purpose in the epileptoid group, while hallucinatory and delusional forms are dealt with subsequently and separately. Confusional states have already been discussed.

(2) By "cycloid" we refer typically to states in which periodicity is a marked feature. These are sometimes marked predominantly by manic phases or by depressive ones, while in others fitfulness is a well-marked characteristic in which epileptoid reactions are common.

These include such different forms of periodic behaviour as caressing and biting, moodiness, fits of violence and rage, alternation of laughing with crying, elation and depression, alternation of stealing with homosexuality, outbursts of insane rage followed by exhaustion and prostration,

attacks of violence followed by laughter, periodic attacks of ocular crises alternating with epileptoid attacks, spurts of energy followed by listlessness, sulky periods alternating with aggressiveness, striking bouts followed by depression, sleepiness giving place to impulsiveness, drowsiness followed by fits of temper, or depression alternating with fits of laughing.

Sometimes the attacks recur two or three times a week and last for an hour; in other cases the manic phase lasts a comparatively short time, but is followed by a depressive or exhausted phase, which may last for several hours. In another case periodic attacks recurred in which the patient would be homicidal for twelve hours, while in another bouts of weeping recurred two or three times a day.

Frank hallucinatory phases were found in 11 males and 8 females, one of the males having hallucinations of taste and of smell, and a female having hallucinations of sight and hearing.

	Males.	Females.
Auditory	7	4
Visual	1	5
Touch	2	0
Taste	1	0
Smell	1	0

Delusional systems were not completely formed, but represented underlying tendencies rather than frank manifestations. They can be summarized as follows :

	Males.	Females.
False accusations of ill-treatment	18	5
Persecution	11	4
Hypochondria	7	1
Poisoning	5	0
Reference	3	0
Grandeur	3	0
Death (nihilistic)	2	1
Fantasy	1	3
Love	0	1

The criteria for assessing the degree of dementia present some difficulty, for the legal requirements of certification lay down that the arrest of development following encephalitis should have been initiated before the age of 18 years. We are, therefore, spared the necessity of differentiating between mental defectiveness due to encephalitis and that from other causes, though in passing we may say that, as in all psychiatric causation, etiology is usually multiple rather than simple.

For our present purpose, however, we have tried to assess the incidence of dementia, and for this consideration the following factors have been selected as the more important :

(a) Such complete physical deterioration as precludes the patient from any healthy form of occupation. This is probably the most important single factor making for dementia in the present group of cases.

(b) Such complete mental deterioration as is manifested by prolonged

loss of control of rectum or bladder, complete withdrawal from reality, and reduction to animal levels. Such cases may be characterized by great ferocity and require seclusion for very long periods.

THE PSYCHOPATHIC EFFECTS OF THE POST-ENCEPHALITIC STATE.

These include a wide variety of different forms of behaviour disorders along with other changes of an abnormal kind.

In the idiot grade (2 males) there is inability to wash, dress and feed themselves, and speech is reduced to inarticulate animal noises, though the patients are frequently noisy, destructive, and faulty in habits.

Sometimes they scream continuously, and they have impulsive outbursts when they attack other people by biting, kicking, scratching and striking. Sometimes they spit, and in their excitement may suddenly jump out of the window, or run madly around the compound; then they throw stones and dirt, and get hold of objects, such as sticks, in order to express their aggressive outbursts. One of the patients was addicted to masturbation, using his legs for the purpose.

The imbecile grade consists of 24 males and 18 females. Although the post-encephalitic may have been of more than average intelligence before the onset of encephalitis, in course of time he may deteriorate to the imbecile level, but in general this grade differs from the picture in higher grades in that he does not usually perpetrate acts of violence or other anti-social conduct which might lead him to the police court, although there are two in the series who were convicted, one of breaking into a canteen and stealing, the other of stealing a cycle. Petty pilfering without conviction is frequently noted.

It has to be remembered, however, that anti-social conduct is more easily overlooked if it is recognized that the patient is so low grade as to be obviously irresponsible for his acts; thus one boy proved a nuisance by begging for coppers, and one girl boarded trams without having the money for her fare.

The chief characteristics of the group are illiteracy, with some impairment of speech, either in the sphere of very much reduced vocabulary or lisping, stuttering, stammering, palilalia, copralalia, echolalia and verbigeration. In other cases speech is reduced to a mutter, with greater or lesser degrees of coherence. Although their habits are slightly more organized than those of the idiot grade, this does not always conduce to cleanliness, for there are a number of cases of which it is reported that they voluntarily and deliberately empty rectum and bladder in the recreation hall, or in their rooms, especially if they are thwarted. It appears as though they use their additional mental equipment for purposes of revenge or self-gratification in ways that are not possible for those of the idiot grade. Thus one patient developed a prolapse of the rectum by putting his fist down his throat to induce vomiting; in the straining which this produced he partially inhibited the vomiting reflex, increasing the intra-abdominal pressure, and must have derived some sexual gratification for this, as he obtained a promise from an unsuspecting medical officer to replace the prolapse with his finger.

This is analogous to cases which carry out rectal masturbation, of which

there are three examples in the series. There are two cases among the females in which regurgitation of food was a feature; one of these would consume the vomitus so induced, and another actually used to practise this disgusting habit with another patient, who would take in the contents of the stomach from lips to lips. Induction of vomiting is a further degree of the same process also found in some of these patients. One patient sucked his gums and spat blood; others exhibit mildly hypochondriacal states of mind. Other patients would soil themselves deliberately, smear themselves, or throw their faeces out through the window. Urine drinking is also recorded. Masturbation, mutual masturbation, indecent exposure, and various forms of homo-sexuality, such as sodomy and fellatio, are also found. In one case it is recorded that he bit the penis of another patient, and on another occasion allowed a higher grade patient to tie a piece of string around his penis.

Swallowing foreign bodies, eating garbage and berries is a feature of some of these cases. Other perversions of appetite include voracious eating, though the subjects are very thin in spite of the large amounts of food they consume.

Various degrees of self-mutilation occur from rubbing the skin with a blanket, picking sores and sustaining cuts through smashing windows, to actual suicidal attempts associated with depression. In the present series these are comprised chiefly of self-strangulation, either manually or with ties or pieces of cloth, and attempts at drowning. One male patient attempted suicide by putting his head down the lavatory. One female patient, however, went to the extreme of attempting suicide by putting the bed foot on her neck.

Other indications of disregard of the instincts of self-preservation are to be found in the ways in which these patients will run madly out into the road without regard to oncoming traffic. Some throw themselves out of windows or on to the ground, while others exhibit an extreme degree of masochism, so that they will ask others to inflict injury on them. In a few cases there is a history of setting fire to objects, burning books recklessly, while one patient fired himself from a lamp. Another patient caused his relatives concern because he turned on the gas and water taps, and ran out into the street, where he stripped himself. Other reckless acts include the case of a boy who rode through the Severn Tunnel on the buffer of a petrol waggon. Climbing windows, roof-climbing (one girl made seven attempts), head banging, wandering into the river, sleep walking and avulsion of toe nails are all recorded features of this group.

Absconding is a well known feature of institutional life, but it has seemed to me that different grades occur corresponding roughly with the level of intelligence of the person concerned. In this particular group it is a fairly frequent phenomenon—15 times in one particular case—but is usually aimless, and appears to be part of the picture of impulsive recklessness so characteristic of the group; thus one girl would run out of the house without shoes on. Truancy and wandering are of a similar nature. A few of these patients like to hide themselves or objects.

A fairly wide variety of violent attacks are also recorded by the usual means of kicking, striking and biting, whilst others use knives, chairs, tables, axes and missiles of various kinds, such as jars, coal, stones, plant pots, crockery,

cutlery, food, water, tea, chambers (with or without contents), blocks of wood and buckets. Some of these patients exhibit their violent outbursts on visiting day, when their relatives come to see them ; others have been objects of great concern to both relatives and neighbours—for example, the male patient who pushed his sister into a pond and attacked his relatives with a knife ; while a few of them have violently entered into premises for the purpose of theft. A common predisposition to this sort of violent behaviour is the liability to periodic outbursts of violent temper associated with great rage and feats of wild energy. One male patient had a predilection for striking doctors, but also struck nine patients one day and twelve the next ! 60 violent episodes were recorded in another case in three years, and one girl was reported to have pulled the hair of 30 different girls. Some of them exhibit a kind of cyclothymia, in which their outbursts are followed by periods of docility and penitence. Some of them even have enough insight to know that they are being possessed by these recurring attacks, in which they are helpless, and will ask to be restrained and to be prevented from striking out. Others appear to have predilections for such peculiarly vulnerable places as the eye. In one case it is recorded that there was blindness in a father and grandfather, and that the patient himself had a congenital cataract, and he was disposed to try to poke out other people's eyes as a sort of protest against fate.

A certain ambivalence of conduct is recorded in a few cases where moods of tenderness and caressing will suddenly give place to one or other of these violent sequels. It will be easily understood that these violent propensities also render the subjects liable to be assaulted in turn. The post-encephalitic is peculiarly susceptible to alternating bouts of restlessness, perhaps with banging, screaming, shouting, and whistling, followed by listlessness, apathy, lethargy, and prostration. In these phases he will lie on the ground, almost as if he were in a state of coma ; and quite frequently a patient who has exhibited Parkinsonian rigidity and tremor, in these phases will appear placid, inert and toneless. Grabbing, snatching and clutching represent other instances of the sort of spasmodic behaviour so typical of many of these patients. Generally speaking the more frank psychotic manifestations only occur in the higher grades, but solitariness, some degree of hallucinations and mildly persecuted attitudes are to be found. One patient exhibited the rather grandiose delusion that he had shot a lion and eaten it for dinner, while another used to pick up imaginary objects from the floor. Mannerisms, repetitive movements, such as ceaseless rocking, form a link with the tics so frequently found in the schizophrenic. Others exhibit gestures, grimaces and mimicry.

Many of the traits that have been outlined may be attributed to mischievous propensities which may prove to be very annoying to the community. Thus one girl in her wandering phases would enter houses and cars and would refuse to leave when so requested.

Another girl took away a painter's ladder and threw the paint into a neighbouring field. A male patient proved to be very difficult to manage because he would get on the floor when asked to go, and insisted on wrapping himself around a table leg.

The remainder of these patients comprise 130 males and 82 females in the

feeble-minded group, with an intelligence quotient of between 50 per cent. and 75 per cent. They conform fairly closely to Henderson's classification of the psychopathic state with his categorization into the following groups :

Group 1: Predominantly aggressive.

- (a) Those who attempt to injure themselves, including cases of suicide.
- (b) Those who attempt to injure others, including cases of murder and assault.
- (c) The alcoholic and drug addict.
- (d) The epileptoid.
- (e) The sex-variants.

Group 2: Predominantly passive or inadequate, with cycloid and schizoid sub-groups.

Group 3: Predominantly creative, of the genius type, with inability to adapt themselves to their particular group, with Lawrence of Arabia and Joan of Arc as examples.

Even this classification, however, is open to a number of objections from the point of view of the present series of cases; thus, like other attempts at classification, it assumes that a given group can be neatly portioned out into sub-groups that do not for the most part overlap, whereas in actual fact there is the most wide assortment of cases in which conformity to the peculiarities of one sub-group is the exception rather than the rule. Furthermore, the classification suggests a broad delimitation between active and passive groups, whereas the present series as a whole shows features corresponding to both aggressive and passive reactions which usually co-exist, though at different times, in the same patient. The third group postulated represents a very unimportant category numerically, and though it suggests possibilities for development towards a particular socially useful end, it must be admitted that in general this fate is very exceptional.

Applying Henderson's particular classification to this feeble-minded group we have 64 (49·2 per cent.) males and 42 (51·8 per cent.) females who have attempted to injure themselves, and 45 (34·6 per cent.) males and 30 (37 per cent.) females who have been classed as suicidal, either on account of actual attempts or serious threats, of whom three males and one female were successful.

125 males (96·1 per cent.) and 78 females (96·3 per cent.) exhibited violent tendencies towards other people, while 50 males (38·5 per cent.) and 33 females (40·8 per cent.) exhibited destructive propensities to property, and 36 males (27·7 per cent.) and 39 females (48·1 per cent.) orgies of smashing windows.

Alcoholism does not appear to present any problem to the present group of post-encephalitics, partly because of the fact that many of them are certified before they are able to develop tendencies to addiction, and partly too because the patient's anti-social proclivities preclude them from the temptation to become convivial drinkers. One remarkable fact, however, is their tolerance to atropine, and there can be no doubt as to their capacity for assimilating this drug, which in course of time becomes a real addiction. Whereas the usual pharmacopoeial dose is $\frac{1}{2}$ mgm. three times daily, with gradually increasing tolerance, they can take up to 16 mgm. without much apparent discomfort, and though the drug has a markedly beneficial effect in some cases,

withdrawal is usually followed by so much deterioration that treatment by resumption is almost inevitable. Males appear to have much greater tolerance than females, and consequently are much more liable to become addicted. Theoretically, these patients who are highly tolerant to atropine should be classifiable as vagotonics, and although they appear to correspond more with the sympatheticotonic type in their strongly developed aggressive instincts (fight), the following selection of recorded features indicate signs of increased vagal and parasympathetic preponderance:

Contracted pupils; sialorrhoea; generalized hyperidrosis, lachrymation; respiratory dysrhythmias; obesity; lethargy; sexual hyperactivity (sacral plexus).

The probability is that the post-encephalitic is not merely suffering from a heightened activity of the vagal parasympathetic centres, but from an involvement of the diencephalic centres, in which there may be a hyposympatheticonia due to fatigue from over-expression of his aggressive propensities.

The epileptoid manifestations of the post-encephalitic state are so varied, and yet so different in many ways from idiopathic epilepsy, that some explanation of the use of the term is necessary. Henderson has drawn attention to the fact that there may be such a condition as the "epileptic character," even though the individual has never had an actual fit in the normal motor sense, and suggests the term "epileptoid" to cover these manifestations of the psychopathic state.

On the other hand, Kinnier Wilson (*Neurology*, pp. 126 *et seq.*) expresses a warning against including under the heading of epileptic phenomena many of the features recorded in the description of cases which have been attributed to epidemic encephalitis, and it is true that many of his contentions have substantial clinical backing. But allowing for this, it does appear that many of the post-encephalitics exhibit periodical attacks which, however they may differ from true epilepsy, have certain similar features, and for want of a better term can be described as "epileptoid." Our main purpose for the moment is to establish facts, and rather to defer the interpretation of them. An illustrative case will show both the difficulties of interpretation and the nature of the facts:

W. B.— up to the age of 9 years was not notably different from other children except that he was backward at his lessons.

When 9 he had a fall. From the age of 10 he frequently had epileptic fits in which he lost consciousness for 6 to 8 hours and bit his tongue. Fits came on at varying intervals: sometimes he would go for 3 weeks without one; at other times he would have 3 to 4 weekly, usually at night, but after an attack for some days he was very irritable and spiteful to his smaller brothers and sisters. He would throw objects at them, including a chopper at his sister, and the father, who was a bricklayer's labourer, was afraid to leave home in case the boy injured his mother. He would strike his little brothers, take them by the throat, and if stopped by the mother, would attack her. He was disobedient, obscene, uncontrollable by the mother, and destructive to his toys. He needed supervision in dressing and washing.

He was considered at 13 to be incapable of receiving benefit from a special school, and never got higher than the 3rd standard at the Council school.

At Rampton, on admission in 1928, 3 years later, his mental age was assessed at about 8 years, and at first it was thought that he was simulating epileptic attacks, because they came on after being annoyed. These were characterized by general choreiform tremors and twitchings affecting trunk, arms and legs, but not the face, along with upward turning of the eyes.

For a while after admission he exhibited periods of muscular twitching which might last for seven days. On other occasions they might begin in the night and last 10 hours. They were separate from the epileptic convulsions, which would produce a loss of consciousness lasting for 3 minutes and were associated with incontinence. The staff could usually foretell when a convulsive attack was supervening by the fact that the eyes would become dull in appearance and turn up slightly, though not to the extent that they would in an oculo-gyric attack. At times a period of twitching would be followed by an epileptic convulsion which would terminate the twitching period. Less often fits would be followed by twitching. At the time of his first admission to hospital the nursing staff were quite confident that there was a large volitional element in the twitching episodes, and stated that they abated when he thought he was not being observed. The incidence of these attacks, both of twitchings and convulsions, continued to vary, but on the whole the latter attacks were rather less frequent than the former (ratio 2 : 3). The twitching attacks often followed violent outbursts of aggression, and were associated with periods of muteness and helplessness when it might be considered that he was unconscious, though after the attack was over he could usually tell what had been happening in the ward. In some of these attacks he was incontinent, but when the regular nursing staff were present who knew his peculiarities by giving him his urinal at regular intervals this could be avoided.

Examined during one of these episodes the following features were noted :

1. Prolonged oculo-gyric attack with external and upward deviation more marked in the right eye than the left.
2. Myoclonic twitchings affecting arms, legs and trunk, particularly on the left side.
3. Marked rigidity of the muscles around shoulders, elbows, wrists, knees and ankles on both sides.
4. Complete loss of abdominal reflexes, with no marked changes in deep reflexes.
5. Attitude of flexion at wrists, extension at metacarpo-phalangeal joints and flexion at the phalangeal joints.

Examined three days later when the attack was over, there was diminution of motor power in the arms and legs, and he was unable to roll from the supine to the prone position unaided. There was some wasting of the muscles of the arms, and to some extent of the forearms, along with spastic rigidity of the muscles of the forearm, shoulders, hips and knees on both sides. The extensor tendons of hands and feet stood out prominently. When he was asked to stand he showed the characteristic attitude of *astasia-abasia*, and on walking had a high stepping gait with some scissors action of the adductors. His reflexes showed absence of abdominal reflexes apart from a slight response in the right lower quadrant, absent cremasteric reflexes and a double extensor plantar response. All deep reflexes were exaggerated, and there was double ankle clonus. Hands and arms showed intention tremor, and there was gross ataxia to heel and knee tests. There was also ataxia on standing with the feet together with a tendency to fall to the left, and ordinarily he had to stand with feet wide apart to maintain his balance. There was no gross loss of sensation except after a fit, when sensation to cotton-wool was diminished as far as the middle of the thighs. Joint sense, sense of position, deep and superficial muscle sense did not appear to be grossly disturbed, but he was not a good subject. Variability in the reflexes has previously been noted, but repeated examination confirmed this, deep reflexes sometimes being grossly exaggerated, at other times appearing within normal limits, ankle clonus appearing and disappearing, and plantar responses being both flexor and extensor on different days and at other times being equivocal. The oculo-gyric attacks were not always accompanied by twitching, sometimes being associated with opisthotonic spasms. At other times they were accompanied by twitchings of the sterno-mastoids. In spite of the general impression that the attacks could be voluntarily induced, but not voluntarily terminated, occasions were reported when the attack was cut short by peremptory command or when the attention was fixed on some particular object.

At times he was noted to show phases of euphoria when he felt confident he was going to get better, and in these moods, attacks of twitching were likely to occur with oculo-gyric spasms.

Frequent loss of weight, as much as a stone in a month, were reported, which may have been due to stuporose periods when he refused food. In general he has maintained a fairly normal weight with a tendency to obesity (weight 10 stones). Sometimes polydipsia was noted, and occasionally pyuria, haematuria and phosphaturia.

Pyrexia of unknown origin has been noted with a temperature of 105.4° with a pulse-rate of 144. On another occasion it was recorded as being 95° with pulse-rate of 56. Obstinate constipation with scybala was a pronounced feature. Periods of confusion, excitement and wandering have also been recorded.

Sir Arthur Hall, who saw him in 1941, reported :

"This low-grade epileptic seems to have been subject to attacks in which there are movements of an athetotic kind. They begin with some deviation of the eyes and retraction of the head. They last for several hours, during which it is thought that he can bring one on, but that once it has developed he cannot stop it.

"I am inclined to think they may be oculo-gyric attacks of a rather exceptional kind, the result of an old epidemic encephalitis. My reasons for suspecting this are :

- " 1. They have been recurring at intervals for many years.
- " 2. They last for several hours, during which, though not unconscious, he is practically helpless.
- " 3. Although it used to be thought in the earlier days that he could bring one on voluntarily and did so at times, it is quite agreed that once an attack has developed, he cannot stop it. (This is quite characteristic of the oculo-gyric attack.)
- " 4. When an attack is over he is quite himself again, and even after all these years there is no evidence of any permanent after-effect of the attacks.
- " 5. They are said to begin with some turning of the eyes and retraction of the head.

"The one point in which this man's attack differs from other oculo-gyric attacks is in the extension of the body muscles generally, in the form of movements of an athetotic kind. Such a thing is, however, by no means unknown. I have seen one or two cases in which there has been widespread torsion spasms with similar athetotic movements during an eye attack.

"Against this view it may be said that the man does not show any other physical sign of encephalitis. This, however, is no criterion that he has not had it. I have more than one post-encephalitic attending my clinic at the Royal Hospital who, except for oculo-gyric attacks, appears to be quite well. One of them is actually a bus conductor on regular duty."

As to the etiology of the oculo-gyric attacks, Jelliffe has suggested that these are not pathognomonic of the post-encephalitic state, but that they may occur in association with paralysis agitans, epilepsy, cerebral syphilis, cerebral tumour, disseminated sclerosis, cerebral abscess, hemiplegia, and general paralysis.

A frequently occurring syndrome in the present series of cases is a previous history of convulsive attacks as some part of the illness, followed by periods of stupor in which the patient would be inert, either on the ground or in bed for several hours, to be followed by outbursts of violence when the patient would suddenly throw himself out of bed, roll around the room and bang his head or sometimes the whole body against the wall or the door. Attacks of howling, screaming and weeping sometimes alternating with helpless fits of laughter are recorded features. Enuresis is a common phenomenon, and frequently is ascribed to pure wilfulness. In a few cases faecal incontinence is associated with it. Many of these patients fall when they are walking, sometimes hurting themselves badly, and lie inert until they are picked up. In other cases periodic outbursts of fury occur in which the patient is homicidal,

and before admission some of them have been diagnosed as epileptic furor. Some of these violent patients will break out into fits of weeping and howling after a violent outburst because they are conscious of these powerful impulses which they are quite incapable of controlling. One patient had a predilection for striking members of the staff, and had enough insight to keep out of the way in case an attack should come on. Another patient would ask the staff to hold him so that he would not do any harm. Other cases, in their violent outbursts, would throw all sorts of objects within reach, often doing great damage in the process. Some cases have been diagnosed as suffering from "petit mal," in which the chief features are attacks of fainting, vertigo, pallor, pseudo-anginous pains, or with cyanosis and respiratory dysrhythmias. Attacks resembling narcolepsy are a fairly common feature of the post-encephalitic state, and occur long after the acute illness has subsided. The patients fall asleep at all sorts of odd times. Frequently they give an impression of trying to dodge work, but they will fall asleep at meal-times, when they are being interviewed, or in the recreation room, when they are playing games. Inversion of the sleep rhythm is a fairly frequent phenomenon in the acute attack, which is sometimes in evidence in the chronic state. Night terror, noctambulism, and periodic attacks of vacancy and wandering are also found. As many of the post-encephalitics try to abscond from institutions it would be quite natural to assume that this was attributable to their disregard of the laws and regulations of their detention, but as so many of them have also exhibited propensities for truancy, aimless wandering and vagrancy, it rather suggests that many of these episodes are of the nature of fugues. Thus Stengel (*J. Ment. Sci.*, **89**, 237) has reported a case of post-encephalitic Parkinsonism with typical fugues with the impulse to wander, and atypical fugues during oculo-gyric crises in which impulses to run away were associated with depression, ocular crises and violent attempts.

The oculo-gyric crises exhibit the same sort of fitfulness in incidence as cases of idiopathic epilepsy. As to the frequency of the attacks, Jelliffe reports from the literature 3 cases in 300 post-encephalitics (Bing), 5 in about the same number (Wimmer), 20 in 100 (Stern).

In the present series of 275 cases they have occurred in 33 patients, and seem to be more frequent in males than in females (26 : 7).

In many cases there occur frequent intervals of crises in a day with periods of remission; at other times there may be complete freedom from attacks; in others there is regular recurrence every two or three days, sometimes lasting a few minutes, sometimes a few hours. Some are induced by efforts of concentration, while other patients state that reading a book or some other occupation which helps to fix their attention will abort an attack. In one patient, going to the cinema will bring on an attack, whereas in another, anticipation of going is sufficient. Many patients are accused of being able to precipitate an attack when they are asked to do some routine task, though it is probable that when an attack has developed, time and relaxation alone will bring it to an end—the amount of time depending on the individual patient. In some cases, however, the attacks may be shortened by the use of hyoscine.

The volitional factor presents quite an interesting problem, for many of

these patients are recorded as having shammed fits, feigned faints, brought on ocular crises to serve their own ends, fallen into attacks of semi-stupor or deliberately urinated, and yet the specific nature of their action makes them fit into a syndrome which is so common to the total group. Thus, of 168 males, 32 and of 107 females 10 gave a history of convulsive seizures, only 5 males and 2 females of whom were regarded as genuine epileptics; 22 males and 17 females gave a history of narcoleptic attacks; 26 males and 7 females gave a history of oculo-gyric crises; 18 males and 9 females gave a history of fainting and *petit mal* attacks; 23 males and 2 females gave a history of repeated falls; 13 males and 11 females were recorded as subject to outbursts of throwing themselves on to the ground or through windows; 18 males and 12 females exhibited attacks of stupor; 17 males and 18 females are noted as being liable to enuresis, while 19 males and 18 females were liable to outbursts of howling.

The sex-variants of the feeble-minded group differ from those of the lower grades, in that they show much greater tendency to homosexuality and all its variations and also to heterosexuality. As in all the propensities we have so far discussed, the differences between the grades consist rather in the fact that the range of perversion is much more restricted in the lower grades; the higher grades exhibit all the tendencies that the lower grades show, along with greater variety, though sometimes a higher grade patient may become infatuated with a lower grade patient and induce him to a homosexual partnership involving mutual masturbation, sodomy and fellatio.

Of the total group of 168 males only 14 cases are not recorded to have shown sexual perversions, if one include urinary and faecal incontinence. Of the remaining 154 the variants are divided as follows:

	Urinary and faecal incontinence . . .	31
Homosexual	{ Masturbation	58
	{ Mutual masturbation	22
	{ Masturbation of others (apparently not mutual)	5
	{ Sodomy	51
	{ Fellatio	41
Heterosexual	{ Offences against little girls	24
	{ Indecent exposure	15
	{ Sexual assaults with rape	24
	{ Other forms of sexual misconduct	2

In addition to this group there are 11 cases of rectal masturbation, some with an associated history of prolapsed piles, prolapsed anus, prolapsed rectum and melaena. In 5 cases the sexual perversions were associated with violence, as a result of which the fraenum was torn. In other cases the penis was injured by being bitten during fellatio, and in other instances match-stems were inserted into the urethra, and pins and ligatures of string were inserted or applied.

Of the total group, 35 (of 168) have had convictions against them for sexual offences; these include:

only to find himself re-certified because he committed the same offence again. This perseveration shows itself in many ways: thus one post-encephalitic thief has an extraordinary penchant for bicycles; another one is a confirmed thief, and when he is detected in his crime he vows he will steal no more, but on search it is discovered that in his pockets are two handkerchiefs and a knife belonging to other patients! This particular patient stole ten hymn- and prayer-books from the church, and gave as his excuse that he "wanted to read." This purposeless stealing is seen in the way that they steal not only objects of little value to them, but also things that are obviously difficult to dispose of. One boy ran off with billiard cues, scooters, cycles, ponies, pigs and chickens that he could never "pass off" without being suspected. At another time he would steal objects and then give them away! But his generosity was not consistent, for he could be brutally violent for the most trivial of reasons.

The highest grade post-encephalitics usually provide a substantial part of the talent for the annual pantomime. Cinderella, Prince Charming, the fairy queen, Dick Whittington's cat—these are all roles that these patients have been known to take. The slight tremor of the voice in soprano or baritone can be quite effective! A few of them go in for writing poetry, and one of them wrote the script for two reasonably long plays. Others learn to play chess tolerably well, though they may be liable to upset the board and become abusive, if not actually violent, when the play is against them.

We have said something about the psychotic traits of the post-encephalitic, but it is to be specially noted that the highest grades are much more liable to frank hallucinatory and paranoid states than the lower grades. Their suicidal attempts also are much more likely to be successful.

NEUROTIC SYMPTOMS FOLLOWING ENCEPHALITIS.

Of neurotic symptoms the following account gives some idea of their relative distribution and the nature of their manifestation:

A number of patients are liable to states of anxiety (7 males, 1 female), with extreme terror and apprehension. In the males, particularly, such attacks may be associated with vaso-vagal symptoms, of "angst," precordial distress, headaches, giddiness, and either bradycardia or tachycardia. Some of the cases exhibit profuse sweating, cold clammy extremities, bradypnoea, either with pallor or cyanosis, and complain of associated fainting attacks, though in the present number there are included only those cases in whom very obvious anxiety is present. In a number of cases, too, night-terrors and sleep-walking are associated. The onset of such symptoms as tremors of the hands, rightly or wrongly, has in some of the patients been attributed to anxiety, though they later developed the full Parkinsonian syndrome. It may be tentatively suggested, though little clinical evidence is adduced in support of the hypothesis, that many of the cases of tremor have a masked underlying anxiety neurosis. They shake because they suffer from unrecognized fear, and in some cases the extra-pyramidal system becomes structurally involved secondarily.

It is difficult sometimes to differentiate *hysterical attacks* from malingering, but here we are including such definite symptoms as hysterio-epilepsy, hysterical

coughing, vertigo, transient paresis, functional ataxia, inability to walk (usually with astasia abasia, but without organic signs), anuria, and globus hystericus (15 males, 4 females). Self-infliction has been considered separately, and although not included under this heading numerically, has affinities with hysteria, especially in the wide range of different symptoms that may be presented, e.g. sucking gums and spitting blood, nose-picking with epistaxis or haemoptysis, dermatitis artefacta and swallowing foreign bodies, or soap to produce pyrexia.

Vomiting is another frequently recurring symptom that has not been listed numerically in this group. In a few cases it is a manifestation of recurring bilious attacks, but in others it is frequently self-induced. Some of these patients have a marked facility for vomiting, apparently without nausea, while induced vomiting recurred in six males and five females. In some of these, vaso-vagal attacks were associated.

Perversions of appetite are fairly commonly encountered. Refusal of food (8 males, 7 females) may occur as a fitfully recurring exhibition of displeasure from various causes, or may go the lengths of definite hunger strike. More commonly, voracity is met with (18 males, 8 females) which may be expressed as in an inordinately big appetite, with gulping of food in excessive quantities, or may be accompanied by eating frogs' legs, twigs, leaves, grass, paper, hair or swill. Sometimes vomiting is a natural sequel to such debauchery; at other times there occurs cyclic alternation of voracity with refusal of food. Less commonly polydipsia occurs, though this may in some cases be attributable to treatment with large doses of atropine. In some cases there appears to exist a syndrome analogous to that of anorexia nervosa, while in a few cases the picture actually resembles that of pituitary cachexia (Simmond's disease).

In odd cases regurgitation of food occurs analogous to those mentioned with effortless vomiting. These latter have been found with the additional characteristic that they re-swallow their vomitus, while one patient would pass regurgitated food through her lips to her homosexual partner.

Malingering has already been mentioned, but the present cases (9 males, 3 females) have exhibited a variety of different traits, such as feigning stupor or fits, sometimes for the purpose of earning a few coppers, or to escape some allotted task. A few have counterfeited typical post-encephalitic symptoms, such as oculo-gyric crises, while others have feigned other somatic illnesses. It is not always easy to differentiate hysteria, hypochondria and malingering, but for the present purpose we have regarded them as distinct in the sense that hysteria is usually unconsciously motivated, malingering is consciously motivated, while hypochondria is much more usually associated with a paranoid outlook and subjective misery with more delusional content.

Obsessional traits also present some difficulty in differentiating them from delusional symptoms, but in their grosser forms are relatively uncommon in the post-encephalitic (5 males and 4 females). The most common of these is obsessional touching. It is probable that the figures given are an underestimate of the real frequency of this symptom, as it is so frequently considered to be part of the post-encephalitic's playfulness. His teasing and

pestering frequently involve "hanging around" other people, who resent his attentiveness. But many of them display a very marked desire for contact with their fellows. In other cases there appears to be a marked obsession with the idea of death. One patient had a very persistently recurring obsession about post-mortems, another one had a persistent obsessive fear that he would "die a coward", and yet another had a delusion that two patients were killed daily by brutal treatment by the staff. Syphilophobia, cancerphobia, claustrophobia and agoraphobia also were present in individual cases.

Neurasthenic symptoms appear in a frequent number of cases. Again there is some difficulty in differentiating on the one hand the fatigability that is a frequent accompaniment of lethargy, and also lassitude and exhaustion that is the usual sequel either to a patient's burst of violent energy, or to the epileptoid attacks described elsewhere. The present cases (12 males, 4 females) do not include those in whom fatigability is associated with lethargy or as a sequel to an epileptoid attack. They have, of course, some relationship with each other, as they also are related to symptoms attributable to effort syndrome. Thus many of the patients with ocular crises quite obviously suffer from their attacks towards the end of the day, but the neurasthenic symptoms mentioned are much less fitful or periodic in their incidence, and are frequently part of the general picture of depression, with its attendant incapacity for prolonged effort, flagging energy, distaste for work, or abulia.

ENCEPHALITIS AND TRAUMA.

It is always difficult to establish a relationship between the onset of neurological disease, or any other organic disease, and trauma, but in some of the following cases the relationship appears so close that some sort of causal significance appears probable.

It is liable to be said that persons who develop neurological disease have accidents or fall because the pathological process has already begun its course. I certainly do not believe this to be true of all the following cases. In some of them the history of trauma is very slender indeed, but perhaps taken together the whole series is more impressive than an isolated example would be.

These are summarized as follows :

Males.

(1) At 9 years began with what appeared to be encephalitis one week after a fall from a street lamp from which he was swinging. He sustained a blow on the back of the head, and developed a haematoma of the scalp. A week later he began to have diplopia and strabismus, and to fall asleep while eating. He was in hospital five weeks, during two of which he was asleep for most of the time, and began his career of stealing one week later, for which he had three convictions. He became untruthful, lacking in control, exposed himself indecently and made assaults on old women and children. He was admitted to R.S.I. four years later, and has periods of homosexual conduct alternating with stealing from his ward-mates. Physically he shows tremor of the tongue and eyelids, slowness of speech, Parkinsonian facial mask and still (17 years later) sleeps excessively.

(2) Already described under "Psychopathic effects." Had a fall on the head at 9, began with epilepsy some months later, with subsequent attacks of twitches, trance-like states and O.G.C. Diagnosed as a post-encephalitic in 1941 (i.e. thirteen years after admission); though he has no other features of Parkinsonism.

(3) Had a fall on the back of the head at 2, when he banged his head on the fender. No history of encephalitis, but exhibited a large variety of conduct disorders until he was certified 17 years later. These included a conviction for thieving, wandering from home, truancy, stealing knives and guinea-pigs, homicidal threats to girls, assaults, self-injury, attempted suicide, malingering, hypochondria, false accusations against staff with delusions of persecution (*cf.* W. H. Gillespie's case, *J. Ment. Sci.*, 1944, p. 582), bouts of mania with restlessness, noisiness, grandiose delusions that he has made inventions, and sexual attacks on the staff and throwing of faeces at them. He was eventually certified under the Lunacy Act, but had previously been diagnosed as a post-encephalitic on account of a Parkinsonism facial mask and posture, and an external strabismus.

(4) A patient who had encephalitis at 16, but whose condition was considerably aggravated by an accident a year later. He had many conduct disorders, but at the time of his admission to R.S.I. at 31 doubt was expressed as to whether he showed any features of Parkinsonism, and the opinion was expressed that he was not a post-encephalitic. Two years later, however, he showed undoubted Parkinsonism, with slurring of speech, general muscular rigidity (L. > R.), tremor of tongue and lips and Parkinsonian mask.

(5) Was knocked down in a cycle accident at 4, developed "brain fever" some months later, certified as a mental defective at 9, and admitted to R.S.I. at 15. He had been charged with stealing two keys, stole from shops, escaped from home and school, and wandered in the street, with a history of having two or three attacks of temper and depression a week. He had marked paralysis, tremor, slow monotonous and staccato speech and a Parkinsonian gait. He died at 19.

(6) Was very athletic, but at 16 fell off a roof, and developed a left-sided paralysis five days later. He had encephalitis a year later, but was said to have made a good recovery apart from a twitch affecting his left side. He had convictions against him for theft, exposed himself to girls, interfered with girls' clothing, and was admitted to R.S.I. ten years later. He attacked patients, injured himself, tore up sheets and books, soiled the floor deliberately, and was quarrelsome with other patients, often getting hit by them in consequence. He had marked Parkinsonism of speech and gait, with rigidity and tremors, especially affecting the left side, and died at 36, as some post-encephalitics do, from gradual dissolution, without other apparent cause.

(7) Fell on a railway line at 5, developed encephalitis at 6, and before admission to R.S.I. at 18 had had nine convictions against him for stealing, housebreaking and indecent exposure. He absconded, attacked staff, threatened suicide, and practised rectal masturbation. He had sialorrhoea, a mask-like face, slurring of speech and tremor of the tongue.

(8) Says he had encephalitis at 9 in 1926, which came on after a hit on the head with a brick. This was followed shortly after by a conviction for theft, when he was sent to an Industrial School. He exposed himself indecently, openly masturbated, stole a purse by feigning faintness and being taken into a house, stabbed boys with a knife, was cruel to pets, killed rabbits and chickens, wandered and absconded a number of times from other institutions. He had a fixed immobile face, with blepharospasm.

(9) Had a bad fall at 7, followed by "meningitis." He went to a special school at 11, and some time later he began to develop attacks which were described as epileptic equivalents, with furor, in which he violently kicked and bit those around him, throwing objects at others, and described these attacks as "a storm that comes over me." He falsely accused a man of making homosexual advances to him, put his hands up his mother's clothes, but was not admitted to R.S.I. until he was 26. At first the signs of Parkinsonism were not very definite, but later showed marked Parkinsonism of attitude, speech and gait.

(10) Had a head injury at 14, in 1921, and was sent to a certified institution three years later, having first tramped the country, slept out, stolen food, and been convicted of stealing lead from a roof. There was no history of encephalitis in this case, and he was not diagnosed as a post-encephalitic until 1930, when he showed left hemiparesis with tremor, slow slurring speech, an attitude of flexion, and mask-like face. He has shown marked delusional formation, said that the staff were shooting people from behind sandbags, that he himself had been shot in the legs, and that a hole in his stomach had been made by a male nurse, who had placed a ball of nicotine or tobacco there. He also falsely believed that his mother

had left him some money (several hundreds of pounds) and that he had never received it. Other delusions were that Hitler had one of his agents in the hospital shooting at people, that somebody he did not know had taken one pint of blood out of him and given it to somebody else, that he had a baby in bed with him, and that he was going to be shot by a rifle aimed at him through the window while he was having his food.

(11) Sustained a depressed fracture of the occipital region of the skull by falling downstairs at school at 8. There are obvious signs of a fracture of the L. parieto-occipital region, confirmed by X-ray. This was followed by an illness described as encephalitis lethargica in which he hardly went to sleep at all for days at night-time, but was very sleepy in the daytime. At 13 he began with another attack of encephalitis in which excessive sleep was marked, and after being charged with offensive behaviour and indecent assault was certified as a defective two years later, and admitted to Rampton at the age of 21, where his chief propensity is the formation of irrational antipathies to other patients, whom he persistently tries to attack. This leads to retaliation, and in consequence much of his time is spent in seclusion both for his own sake, and for those whom he would try to injure. The chief physical signs are slurring of speech, Parkinsonian immobility of face, bent posture and Parkinsonian gait.

(12) Sustained an injury to the head at 8, when he was knocked down by a cyclist. No history of encephalitis, but up to the age of 16 when he was certified M.D. gave trouble to his parents by striking the different members of the family, interfering sexually with other boys, open masturbation, and by conviction for stealing money. At 14 other boys set on him and bumped his head fiercely on the pavement, no doubt after much provocation. He came to Rampton at the age of 28, with a record of vicious and hasty conduct, gave trouble by his frequent fights, masturbated other patients, was destructive and gluttonous with his food. Physically his face showed great immobility, all movements being slow and deliberate, with "quick and lifeless" speech; he had contracted sluggish pupils, frequent blinking of the eyes, Parkinsonian tremor of the right hand, and some spasticity of all limbs.

(13) Was perfectly normal until he fell from his pram at 15 months, when his development became retarded, and he had to go to a special school. He was certified at 10, and was sent to an institution. His chief propensities then were restlessness, mischievousness, irritability, bad temper, wandering, especially at night, frequent falls, when he often hurt himself, violent outbursts of temper, when he gave and received many blows. At 22 he was admitted to R.S.I. and committed sexual misdemeanours such as sodomy and mutual masturbation. He has Parkinsonian features, such as facial immobility, with gaping mouth, contracted sluggish pupils, slow drawing voice and kyphoscoliosis.

(14) Had a history of encephalitis at 10, which followed a fall from a roof, when he was subsequently unconscious for 24 hours. He was not long before getting about again, but attacks of oculo-gyric crises occurred at 15-16, and certification and admission to Rampton at 17. He had previously had convictions against him for rape and for stealing a motor cycle. He absconded three times, and after being brought back confessed that he had committed a murder. He had auditory hallucinations, marked Parkinsonism of gait with festination, sluggish pupils, increased muscle tone, tremors of fingers and tongue, sialorrhoea, thick monotonous speech and recurring oculo-gyric crises every few days, lasting eight hours.

(15) Broke his nose at 12, followed shortly after by an attack of encephalitis lethargica. His main features before certification eight years later were truancy, wandering, and violence to others. He was admitted to Rampton at the age of 27, but died two months later from lobar pneumonia. He showed Parkinsonian facies and speech, sluggish pupils, oculo-gyric crises, general tremors and inco-ordination of fine movements.

(16) Fell from a tree and cut his head at 11, followed shortly after by "cerebro-spinal fever," when he slept for a month and had to be taught to walk again, and developed what were thought to be epileptic fits. He was certified as a mental defective at 13, after convictions for stealing, which seemed to be quite purposeless. Thus he stole food, but if he was not hungry would throw it away. He was impulsive, endangered his life by running behind cars, struck at children and then laughed at them, stabbed a man in the back of the head with a cobbler's awl, and showed

strong propensities for climbing trees. After admission to Rampton at 18 he attempted to climb the roof three times, danced on the roof tiles in hob-nailed boots, and stood on a chimney top 60 ft. from the ground on one leg. He threatened suicide several times, bit his left knuckle so viciously as to expose his extensor tendons, frequently cut himself with glass, violently assaulted other patients, sometimes for the purpose of sodomy, picked their pockets, stole keys, and absconded. He had attacks of depression, suffered from auditory hallucinations, and manifested a divergent strabismus, sluggish pupils, frequent blepharospasm, proptosis of the eyes, tremors of the head and arms, with ataxia. He died at the age of 30 with signs of bulbar palsy and progressive muscular atrophy secondary to encephalitis.

(17) Had an injury to the head at 4 and an injury to the back at 5, and began with encephalitis at 7. He was certified as a mental defective at 15, and admitted to Rampton at 19, where his main propensities were impulsive and periodic outbursts of violence, in which he struck nine different patients one day, and twelve the next. He had a special predilection for striking medical officers, threw his food, and deliberately urinated on the floor of the patient's recreation hall. He had periods of mental confusion and showed characteristic Parkinsonian facies, with sluggish irregular pupils, slurring of speech and spasticity of the legs.

(18) After a knock on the head at $4\frac{1}{2}$ developed encephalitis lethargica, but was not certified as a defective until 18, when he was admitted to Rampton. He had attacks of listlessness and helplessness when he lay on the floor and moaned, had frequent falls, soiled his room, lay about the day room half-dressed, and wandered around aimlessly. He tried to abscond and had periods of violence, destructiveness and fits of laughter alternating with depression. He had Parkinsonism of attitude, speech and gait, small pupils, attacks of oculo-gyric crises, and polydipsia. He died a year later from lobar pneumonia.

(19) At the age of 18 he had an accident in the pit when he sustained an injury to the right side of the head and was unconscious for three days, but he seemed to recover quickly and then joined the army. Four years later he developed encephalitis, i.e. at 22. From the age of 16, however, he was convicted of indecent exposure, and up to the time of his admission to Rampton at the age of 26 had 20 convictions against him for indecent exposure and assault, burglary, larceny and begging. He wandered around the country, took things from his own home and gave them to strangers, and proved himself to be an anxiety to his family and the neighbourhood. At R.S.I. he bullied and fought other patients, was liable to impulsive outbursts of violence, followed by helplessness and prostration, masturbated excessively, and practised sodomy. He had marked Parkinsonism of facies, speech and gait. Pupils were sluggish, his tongue and all his limbs showed tremor, though the left side was worse than the right, his posture was bent, and his musculature showed increased tone.

(20) States that he was run over by a lorry at 7, and developed "fits" shortly after. He never had an attack of acute encephalitis, but physically shows sialorrhoea, unequal pupils, nystagmus of the lids, slurring and slowing of speech, a left-sided hemiparesis with muscular rigidity. He had been liable to "attacks of epilepsy" about three times a year, in which the face flushed, the expression went blank, though consciousness was not completely lost, and were sometimes associated with vertigo and vomiting. He was certified as M.D. at 18 and admitted to R.S.I. at 29, and showed impulsively violent conduct, with some mild episodes of incendiarism, when he set fire to paper in the ward. He was liable to periods of depression, when he threatened suicide, and was addicted to fellatio.

(21) Had an accident at 6 when a number of ribs were broken, and developed encephalitis at 7. He was treated at the Winchmore Hill Hospital (L.C.C.) for encephalitis, certified at 14, and admitted to R.S.I. at 19. His chief propensities had been petty thieving, wild behaviour when he ran in and out of other people's houses, shouted in the streets, and used to pretend to have epileptic fits in order to gain sympathy and money. At Rampton he injured himself, was destructive to property, and was addicted to sodomy. He fought the other patients, accused the staff falsely of ill-treatment, grabbed food from other patients' plates, pretended that he was blind in one eye, and feigned illness. Physical signs included sluggish, irregular pupils that failed to react to accommodation, weakness of the left external rectus, inequality of the face, excessive salivation, some atrophy and weakness of the left pectoral muscles, and tremors of the hands. There was no definite history

of oculo-gyric attacks, but there was some fluttering of the eyelids and some tendency for upward deviation of the eyeballs when tested.

(22) Had a shrapnel wound of the head in the First Great War at the age of 16, when he was unconscious for an indefinite period, and began with fits of trembling which were ascribed to "shell-shock." There was no definite history of encephalitis, but he was admitted to R.S.I. at 25, after having two convictions for stealing, and five for drunkenness and begging. There was marked impairment of memory, with changes of a psychotic kind, such as hallucinatory phases, and strong paranoid colouring, depression alternating with grandiose ideas, and morbid obsessions about post-mortems. He had periods of violence, rectal and mutual masturbation, sodomy and absconding. He tried to make a key for absconding purposes, and injured himself. He had Parkinsonism with facial immobility, excessive salivation, monotonous speech, tremors of the eyelids, tongue, hands and feet, and muscular rigidity of both legs, and only in recent years has shown hypersomnolence.

(23) Had a bad fall with injuries to the head at 3, followed by a severe attack of "influenza" in 1923 at 12, which was subsequently considered to have been true encephalitis. He was admitted to R.S.I. five years later after being convicted for an assault on a woman. Had a record of stealing from 1925. He was a wanderer who was noisy, destructive, violent and aggressive, lazy, restless, pestered and bullied other patients. He picked his skin, threw his slippers at other patients, refused work, tried to abscond and indulged in mutual masturbation. He had a large head with circumference of 26 inches, marked internal strabismus and small pupils. Ten years elapsed (i.e. in 1938) before he showed any other physical residua of the post-encephalitic, when he began to develop tremor and rigidity of the right arm and leg, though later developed butterfly flutter of the eyelids, salivation, and tremors of the jaw, lips, tongue and both arms.

(24) Was involved in a severe pit accident in 1929, when he fractured his leg and had a spell of unconsciousness. He was certified as M.D. at 15 in 1929, and had convictions against him for stealing a cycle and setting fire to a hedge. He was involved in another accident in 1937 when he was concussed, and was admitted to Rampton in 1938 because of a sexual offence against a girl whilst he was on holiday from an institution. On admission he had slurring of speech, with fine tremor of the hands at rest, but was not considered at this time to be a post-encephalitic though the possibility was considered. Years later he showed definite Parkinsonism of the right side of the body with dullness of facial expression, the right side of the face being more affected than the left.

(25) Admitted in 1940 at 16, with a previous history of head injury in a motor accident and no previous history of encephalitis. He exhibited a number of mannerisms and habit-spasms, such as sucking his fingers, bending repetitively, putting his hands before his face and blowing into his fingers, rubbing both his eyes after speaking and biting his right thumb. He kicked, stole, tore his clothes, wilfully emptied urine and faeces on the floor and had a voracious appetite. His reflexes were sluggish, and he had lack of control of fine movements, deficient joint sense, and unsteadiness of gait along with Parkinsonian features.

Females.

(1) Had a fall on the back of the head at 10 months, followed by convulsions, and was backward in development, late in walking and talking, and was certified as defective at 22 and admitted to Rampton five years later for violent conduct, throwing stones, attacking people and throwing them to the ground, hitting out, spitting, going into people's houses uninvited and smashing chambers. She fractured another girl's jaw and tried to pull away a ladder a painter was using and threw the paint in the yard. She is dull in expression, salivates frequently, has fixed features and some muscular rigidity.

(2) Developed encephalitis at 14 in 1922, after a fracas in her father's public house, when she sustained a blow on the neck from a beer mug. She had ten convictions against her for larceny over a period of years, but was not certified until 1936, when she was admitted to Rampton. She had sudden outbursts of fury, violently assaulted others, injured herself, was destructive to windows and clothing and exhibited a number of persecutory ideas, especially against members of the staff. She had periods of agitation, and pestered both nurses and patients. She had Parkinsonian tremor of the left hand and foot, with fixed facies.

(3) Developed encephalitis at 12 in 1920, which was preceded by a severe blow on the head while bathing. She was treated at the Newcastle Royal Infirmary, and was away from school for three months. She was not certified as defective until 14 years later, when she was violent to her sister and ran away from her home in Newcastle to London, where she alleged that men molested her. She was admitted to Rampton at 29 in 1937 where she exhibited orgies of smashing, violent struggles and self-mutilation. On one occasion she climbed to the top of a three-storied building and threatened to throw herself down; on another occasion she barricaded the recreation room and smashed 31 panes of glass. She was a petty thief and made sexual attacks on the staff, tied her neck up and periodically had attacks in which she fell to the ground limp and motionless. Apart from periods of excessive somnolence, she shows no marked physical residua of encephalitis.

(4) Was a delicate child and was said to have cried all through each night until she was 2. She did not begin to talk until she was 3, at which age she was knocked down by a taxi, followed shortly afterwards by a fall downstairs. There was no history of encephalitis, but she was certified as a defective two years later and admitted to Rampton at 9 in 1928. The history was that she used to go into other people's houses or motor-cars and refuse to leave them when requested. She was vicious to the members of her family, would bite and kick her mother and baby sister, and would kiss her brother and then scratch him; she bit the legs of a cat and a dog. She wandered at large for miles. At Rampton she removed the blocks from between the hot-water pipes and threw them at other patients, and was so violent over such a long period of time that for many years she had to be kept apart from the other patients, as any opportunity for contact with other people, from the chaplain downwards, would be followed by a violent onslaught. Apart from myoclonic twitchings of the face and of both legs there were no physical signs of Parkinsonism, though Sir Arthur Hall diagnosed her as post-encephalitic. She exhibits a pituitary form of obesity which has been described in cases of this kind.

(5) Banged her head on the table at the age of 9 in 1922, and developed encephalitis seven weeks later which was associated with hypersomnolence. She was certified as defective at the age of 10, after a history of recurring drowsiness at school, nocturnal restlessness and wandering, and violent attacks on her mother. She was admitted to Rampton at the age of 15, where she was liable to recurring attacks of impulsive violence, stealing, and destructiveness. She is a well-marked case of Parkinsonism, with oculo-gyric crises, generalized tremors, spasticity of legs, attacks of hyperpyrexia (temp. 106°) and spends most of her time curled up in bed.

BEHAVIOUR DISORDERS WITHOUT PARKINSONISM.

Out of 168 male cases, 31 gave a definite history of encephalitis without showing any gross signs of Parkinsonism, such as muscular rigidity or tremor, while 29 gave no definite history of encephalitis, and yet showed definite Parkinsonism. Of 107 female cases 26 gave a definite history without showing gross Parkinsonism, and 10 gave no definite history and yet showed definite Parkinsonism. Of those giving a definite history of encephalitis without gross physical residua, we find a group of behaviour disorders of the most vicious type;

A man who had encephalitis at 7 was admitted to Rampton 16 years later from prison, where he had been committed on two offences of larceny, and had three previous convictions, of fraudulent conversion, stealing a cycle, and stealing £5. He had been a wide traveller, had sought a living as a waiter and as interpreter, and had lived at Marseilles as a dock labourer, but had been deported from France for hitting out at a stranger. He had been dismissed from many jobs because he quarrelled with his employers about trivial things. His criminal career began only two years before admission, but his anti-social career began some years previously. He proved a most intractable case, assaulting other patients, attempting suicide by hanging, and in collaboration with another patient climbed the roof of the institution where he had stayed for 7½ hours, and did £300 worth

of damage by smashing windows and tearing up the roof. He made attempts to abscond, and was involved in a plot to make pass keys from a pattern he had managed to procure. He inflicted injuries on himself, scraped the back of his throat with a chiv he had made himself, and was a sexual pervert, a confirmed masturbator both by himself and with other patients. He also gave a history of having behaved indecently with women prior to admission. He was a Jew, and deludedly felt persecuted in consequence.

The other cases are interesting from many points of view. Details of them are summarized below :

Of 31 male cases with a definite history of encephalitis, without gross Parkinsonism, the details of their physical residua may be summarized as follows :

1. Ocular changes (11 cases) :*

Contracted pupils	2
Irregular pupils	2
Unequal pupils	2
Failure to react to light or accommodation	3
Dilated pupils	1
Staring eyes	1
Strabismus	2
Faulty convergence	1
Diplopia	2
Ptosis	5
Blepharospasm	1
2. Disturbances of sleep rhythm (11 cases) :

With excessive somnolence in the daytime	3
Lethargy	8
3. Disorders of the vegetative nervous system (10 cases) :*

Fainting attacks	6
Bradycardia	4
Hyperidrosis of limbs	1
Acrocyanosis	2
Irregularity of respiratory rhythm	1
4. Perversions of appetite (1 case) :

Voracity	1
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5. Endocrinopathies (5 cases) :

Effeminacy of physical constitution	3
Hypogenitalism	1
Hypopituitarism with sexual infantilism and mongoloid features	1
6. Motor symptoms (18 cases) :*

Convulsive attacks	3
Tics	2
Twitching attacks of limbs (myoclonus)	2
Dullness of facial expression	4
Speech defects	5
Slight tremors of hands	6
Muscular hypotonia of limbs	5
Slight hypertonia of limbs	2
Kypho- or lardo-scoliosis	4
Liability to frequent falls	2
Urinary incontinence	1

* A number of the cases presented more than one feature under one or other of the 3 categories so marked.

Although the physical residua of these patients are much less in evidence than the main group, their anti-social menace is indicated by the fact that 25

of them had been at some time or other convicted of various offences classified as follows :

A. Classification of criminal offences of 25 of 31 post-encephalitics without gross Parkinsonism.

I. Damage to property :

1. Travelling on the railway without ticket, stealing cycles, money and articles.
2. Three convictions for larceny.
3. Stealing a cycle.
4. Convictions for housebreaking, larceny and stealing money.
5. Stealing a suitcase and motor-car.
6. Stealing a cycle and a motor-cycle at 14.
7. Thieving.
8. Convictions for stealing money and clothing. Broke into a shop.
9. Four convictions for larceny at 20.
10. Five convictions for stealing beginning at 8. Broke into shop.
11. Stealing tobacco.
12. Stole a cycle.
13. Conviction for larceny.
14. " " and stole a cycle.
15. Two convictions for theft.
16. Conviction for stealing a handbag.
17. " " " cycle.
18. Two convictions for larceny from age 21, and fraudulent conversion.

II. Damage to others :

1. Three convictions for assault.
2. Conviction for assault at 7 years 11 months.
3. Knifing other children.
4. Violent attacks on mother and another woman.
5. Cut a boy's head with a hatchet.
6. Violent assault on boy of 13. Grievous bodily harm.

III. Sex offences.

1. Indecent exposure to women.
2. Indecency with boys from the age of 14.
3. Two convictions for indecent assault.
4. Indecent exposure.
5. Violent sexual assaults on little girls.
6. Indecent assault on a girl of 7.

B. Summary of anti-social characters of the 31 patients without gross Parkinsonism, for which no convictions were made, previous to admission.

I. Damage to property.

1. Threw stones. Thieves.
2. Steals.
3. " "
4. Broke into a canteen.
5. Cut gas pipes. Lit fire on bedroom floor.
6. Broke into a shop.
7. Tried to fire a boy's bed.
8. Stole key.
9. " " "
10. Stole a cycle.

II. Damage to others.

1. Attacked the police.
2. Kicked his mother. Stuck pins into children.
3. Struck his father.
4. Struck people frequently with the poker.
5. Killed a patient at a mental hospital, and tried to strangle another with his neck-tie.
6. Tried to strangle his sister and another girl.
7. Strangled a cat and gave the entrails to another cat.
8. Deported from France for hitting a stranger.

III. Sex offences.

1. Talking indecently to small girls.
2. Sex impropriety with baby sister.
3. Sexual attacks on girls.
4. Molested and masturbated boys.
5. Indecent behaviour with girls.

IV. Miscellaneous.

1. Stowaway on a ship.
2. Stayed out all night. 15 situations in two years from age 13. Climbed out of window 13 ft. high.
3. Threw himself downstairs. Ran away from home often.
4. Absconded from another certified institution 14 times.
5. Stowaway on a ship. Left articles in ships. Truant.
6. Vicious wandering.
7. Begging.
8. Absconded from an institution—then convicted of stealing.
9. Twenty situations in six months. Discharged from sea and army because of unsuitability. Absconder from a certified institution nine times in ten weeks, stealing the keys on one occasion.
10. Frequently ran away from home. Wandered into rivers and on the railway. Sudden impulses to do wrong. Absconded eight times from a C.I.
11. Frequent jobs, wandering and begging.
12. Truant.
13. Careless about fire. Took things hot from pans.
14. Truant. Rode through the Severn Tunnel on the buffer of a petrol truck.
15. Dismissed from many jobs for quarrelling with employers about trivial things.

c. Summary of traits of anti-social nature observed at Rampton.

I. Damage to property.

Sixteen patients exhibited destructive properties ; these included smashing, tearing clothing, damaging the roof and slates (to value of £300), throwing stones through windows, damaging a weaving loom by putting a pair of scissors into the machinery, trying to set fire to the ward, pilfering, trying to force a window with an iron bar for the purpose of absconding, deliberate breaking of dentures (on five occasions), smashing electric light with a chamber, throwing furniture about and wilfully damaging books.

II. Damage to others.

Twenty-five patients exhibited violent traits to patients and staff. These included homicidal attacks by strangling, impulsive attacks, striking, kicking, biting, scratching, pinching, spitting, attacks with dangerous weapons, such as chisels, buckets, brooms and spades, throwing stones, screwdriver, steel, food cups, knives and billiard balls.

III. Sex offences.

Twenty-eight patients exhibited abnormal sexual activities while in the institution. These included masturbation, rectal masturbation, fellatio and sodomy. One of the patients formed a gang for homosexual practices, three of them sustained injuries to penis during homosexual practices, either from bites or of tearing of the fraenum, two of them were noted as being male prostitutes and importuners, two of them were recorded as sustaining a prolapsed anus and prolapsed rectum from rectal masturbation. This appears to be a not very uncommon sequel to sodomy, and may occur with prolapsed piles and melaena. One patient pushed a match stalk up another patient's urethra, while others made a practice of exposing themselves indecently.

IV. Self-injury.

Seven patients were noted as displaying tendencies towards self-injury; seven of whom attempted suicide, one successfully. Others scraped themselves with knives or sharp instruments, deliberately burnt themselves with cigarette ends, reopened old wounds, violently precipitated themselves against a door or wall, swallowed foreign bodies, persistently induced vomiting, impulsively threw themselves out of bed, while another would eat garbage, including worms, plaster, and swill for the pigs.

Of the 26 female cases with a definite history of encephalitis without gross Parkinsonism the following case affords a good example:

It is the case of a girl who was admitted to the London Hospital at the age of 18 in July, 1931, who for 14 days had felt ill and drowsy. She complained of diplopia followed by drooping of the left eyelid, some difficulty in the selection of words, numbness of the upper left limb, and was incontinent of urine, but not of faeces, On examination at that time the chief abnormalities were:

1. Slow monotonous speech.
2. Ptosis oculi (left).
3. Slow nystagmus on lateral fixation to the left.
4. Left external rectus palsy.
5. Defective upward movement of the eyes.
6. On looking to the right, the left eye turns downwards and inwards.
7. Slight left facial weakness.
8. Pupils equal, not quite circular; react to light and on accommodation.
9. Coarse involuntary movements of all four limbs.
10. Spastic weakness of the lower limbs; equivocal plantar responses.

The course of the illness was afebrile; pulse and respiration rate varied between 80-90 and 20-22 respectively. The W.R. was negative in the blood and C.S.F., colloidal gold curve 0022211000, chemical analysis and W.R. were negative, as also that of the blood. Blood count: R.B.C. 5,100,000, Hb 75 per cent. C.I. = 73. W.B.C. 9,000. Differential count normal.

After four weeks in hospital she became incontinent of faeces as well as of urine and haematuria also occurred. She was then discharged without much progress being recorded to an Isolation Hospital, from which she was sent home after five or six weeks.

At home her conduct was noted as being very eccentric, and in September, 1931, she was admitted to Brentwood Mental Hospital as a voluntary patient, but absconded the following March.

Subsequently she proved a very great trial to her parents, who spent a considerable amount of time trying to find her when the wanderlust came over her, which was fairly frequently. She had five convictions against her for stealing, lived a very immoral life, and was sent to Borstal.

On one occasion she accosted a porter, exposed herself, and offered herself or the price of a cigarette. At the time of her admission to St. Mary Abbot's

Hospital she admitted that all her clothing was stolen property. At this time in 1936 her mental age was assessed at 12 years with scattering. Since her admission to Rampton in October, 1936, she has justified all the remarks made as to her previous character. She exhibited flights of ideas, professed to be a student of music at the Royal Academy, talked at considerable length, was elated and lewd, masturbated openly, exposed herself at the window to male patients, stole other people's property, was destructive to windows, and showed such a strong addiction to snuff that she has been known to exchange valuable gifts sent to her by her own people for quite small quantities. Her mental age, however, has shown considerable improvement, and when it was last tested by Terman-Merrill scale was 17 years 2 months (I.Q. 114). To ordinary clinical examination there are no physical residua of encephalitis, except for contracted and sluggish pupils.

Of the total of 26 female cases with a definite history of Parkinsonism, the physical residua exhibited were :

1. Ocular changes (9 cases) :

Pin-point pupils	1
Irregular pupils	3
Pupils with sluggish reaction to light	3
Pupils inactive to accommodation	1
Dilated pupils	1
Exophthalmos	1
Strabismus	1
Diplopia	2
Ptosis of eyelids	1
Tremor of eyelids	1
Rotatory nystagmus	1

2. Disturbances of sleep rhythm with alternation of sleep and wakefulness (5 cases) :

Noctambulism	2
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3. Disorders of the vegetative nervous system (5 cases) :

Fainting attacks	3
Low blood pressure and bradycardia	1
Raynaud's disease	1
Acrocyanosis	1

4. Perversions of appetite (5 cases) :

Polydipsia	2
Urine drinking	1
Anorexia nervosa	3

5. Endocrinopathies (15 cases) :

Obesity	1
Sexual hypoplasia	1
Pituitary cachexia	1
Emaciation without assigned cause	1
Amenorrhoea	6
Thyroid enlargement	11

6. Motor symptoms (12 cases) :

Convulsive attacks	3
Pseudo-stuporose attacks with attacks of complete listlessness and tonelessness	3
Dullness of facial expression	2
Facial twitching	1
Lower facial palsy	1
Tremor of tongue	1
Speech defects	2
Tremor of an arm	1
Pes cavus	2
Urinary incontinence	3
Prolapse of rectum	1

A. Ten of the 26 cases had convictions against them ; these were classified as follows :

I. Damage to property.

1. Five convictions for stealing.
2. Convictions for stealing a cycle, handkerchiefs, stockings and knickers.
3. Conviction for shop-lifting.
4. Conviction for stealing.
5. Conviction for begging.
6. Convictions for arson and stealing.
7. Convictions for begging, stealing and fraud.
8. Five convictions for stealing.

II. Damage to others.

1. Convictions for violent assaults.
2. Three convictions for assaults and wounding.

III. Sex offences.

1. Conviction for prostitution.

B. Summary of anti-social characteristics of the 26 female patients without gross Parkinsonism, without convictions previous to admission to Rampton.

I. Damage to property.

1. Destructiveness.
2. "
3. Smashing and throwing stones.
4. Destructiveness.
5. Stealing and smashing.
6. Destructiveness to clothing and smashing.
7. "
8. Barricading, smashing and stealing.
9. Destructiveness to clothing.
10. Destructiveness.
11. Stealing.

II. Damage to others.

1. Assaults.
2. Sudden impulsive violent assaults.
3. Stripped a child and put it in a bed of nettles.
4. Biting and scratching.
5. Fighting and throwing stones, etc.
6. Pulling out hair.
7. Pulling out hair of 30 different girls.
8. Excessive violence to others.
9. Fighting and biting.
10. Pulling out hair and throwing stones.

III. Sexual misconduct.

1. Gross immorality.
2. Had an illegitimate child.
3. Immorality and masturbation.
4. Had an illegitimate child.
5. Contracted gonorrhoea.
6. Falsely accused men of immoral intentions.
7. Had an illegitimate child.
8. " " "

IV. Miscellaneous.

1. Running in front of traffic to stop it.
2. Wandering on the railway lines, lying in the road, entering other people's houses and cars; hid herself in a bread van and rode in it for eight miles.
3. Disappeared from home for a few days. Absconding.
4. Absconding.
5. Wandering at large.
6. Absconding.
7. "
8. "
9. Ran away to London.
10. Absconding.
11. Absconded three times.
12. Absconding.
13. "

c. Summary of anti-social traits observed at Rampton.

I. Damage to property.

Eighteen patients exhibited destructive propensities to property, including three roof-climbers. One of these had the agility of a monkey, and even in seclusion developed the property of scaling her interior wall and holding herself in the most impossible of positions. Others would be content to climb the windows. Some stole food and other objects from their neighbours. Some of these cases exhibit the purposeless hiding of things, without any motive other than that of pure mischievousness.

II. Damage to others.

Twenty-four of these patients exhibited violent conduct to other patients and staff.

III. Sex offences.

Five exhibited abnormal sexual tendencies; these comprised two masturbators; one rectal masturbator; one homosexual; one indecent in manner; and one who made sexual attacks on others.

IV. Self-injury.

Twelve patients exhibited propensities for self-injury. These included rubbing the skin with blankets, cutting themselves with glass, throwing themselves downstairs, or out of bed, head banging, swallowing foreign bodies, and writing on the wall in their own blood. They include seven who were suicidal, and who tied up their necks, with one who drank Ronuk with suicidal intent.

Cases with no definite history of encephalitis, yet showing definite Parkinsonism now:

29 male cases (of 168).

10 female cases (of 107).

Of these we may enumerate the following, of whom 23 males and 8 females were not diagnosed as post-encephalitic for some time after admission.

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|-----|---|---|---|
| No. | Previous history. | Psychopathic symptoms. | Physical signs and symptoms. |
| 1. | History of measles. Certified M.D. at 10. Admitted R.S.I. at 14½. Diagnosed P.E.L. at 22 | Wanton destructiveness at home. Truancy from home for long periods. Roof-climbing. Plays with fire. Noisy. Hypochondriac. Self-injury. Eats rubbish. Masturbator. Threatened suicide | Restless purposeless movements. Lachrymation. Parkinsonian features. Stares. Tremor of hand. Slurring of speech. |
| 2. | M.D. from early age. No history of encephalitis. Brought up at Dr. Barnardo's. At an industrial school at 9. Admitted R.S.I. at 16½. Not diagnosed as post-encephalitic till 24 | Conviction for larceny at 9. Many thefts. Violent attacks against patients and staff. Bites. Epileptoid attacks—throwing himself on the floor. Impulsive. Smashes glass. Homosexual. Masturbator | Marked Parkinsonism. Gapes. Spastic R. leg. Self-induced vomiting. Helpless without atropine. Attacks of howling and lachrymation. |
| 3. | Observed as M.D. from childhood. Certified at 18½. Admitted R.S.I. at 20½. No history of encephalitis. Diagnosed P.E.L. at 30 | Epileptoid attacks—fits of temper; falls and cuts face. Fell through train window. Attempted drowning. Fights. Impulsive. Got out through skylight. Interferes with children | Coarse Parkinsonian features; fixed, immobile. Irregular uneven pupils. Parkinsonian speech. Spastic L. leg. Frequent falls. Pes cavus (R. and L.). Improved on atropine. |
| 4. | Head injury at 9. Epilepsy from 10. Certified M.D. at 16. Admitted R.S.I. at 16. Diagnosed P.E.L. at 29 | Violent, destructive. Impulsive. Injures self | Ocular crises. Myoclonic attacks, as well as epileptiform changes. Variable pyramidal signs. |
| 5. | Certified as M.D. at 9½. Admitted R.S.I. at 9½. No history of E.L. Signs of P.E.L. noted from 18—gradually increasing | Conviction at 9—of killing a rabbit maliciously. Has an obsession with death. Pillfers. Wanderer and absconder. Violent. Suicidal. Homosexual | R. hemi-Parkinsonism, with muscular hypertonia noted in 1938. Two years later general muscular hypertonia. Slight tremor of both hands. Fixed Parkinsonian facies. |
| 6. | History of measles. No history of E.L. Fall on back of head at 2. Not diagnosed P.E.L. until 32. Certified M.D. at 20½. Admitted R.S.I. at 21 | Conviction for thieving. Wanderer. Truant. Extremely violent and vicious. Self-injury. Sexual attacks on staff. Masturbator. Homosexual. Maligner. Hypochondriac. Suicidal. Threw faeces at staff. Paranoid. Delusions of persecution. Certified insane | Parkinsonian facies and posture. R. external strabismus. |
| 7. | Noted as defective from 18 months. Certified at 3½. Admitted R.S.I. at 14½. Unable to read, write or talk properly. No history of E.L. Diagnosed P.E.L. at 19½ | Violence to self and others. Screaming fits—? epileptic history. Passive homosexual. Masturbates openly. Bangs his head violently on chairs. Grimaces. Impulsive. Incontinent | Parkinsonian facies. Slurred speech. Rigidity and choreiform movements of arms. Tremors of legs. Festinant gait. Flexion posture of trunk. |
| 8. | Head injury at 14. No history of E.L. Certified M.D. and admitted R.S.I. at 19. Diagnosed P.E.L. at 31 | Conviction for stealing lead pipe from a roof. Vagrant. Absconder. Sleeps out. Steals food. Voracious. Hypochondriac. Destructive. Violent. Homosexual. Masturbator. Fantastic delusions. Hallucinosi | Fixed immobile features. L. hemi-paresis, with tremors of arm and leg. Flexion posture. Parkinsonian speech. Chronic otitis media and aural polyp. |

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|--|--|---|--|
| <p>No. 9. Head injuries at 8 and 14. Certified as M.D. at 16. Admitted to R.S.I. at 28. No history of E.L. Diagnosed P.E.L. on admission</p> | <p>Previous history.</p> <p>Conviction for stealing. Vicious and hasty. Destructive. Homosexual. Masturbator. Absconder. Voracious. Apathy. Lethargy with impulsive outbursts</p> | <p>Psychopathic symptoms.</p> <p>Charged with malicious wounding at 9. Fits of screaming, kicking, biting, throwing objects, smashing and destructiveness. Steals. Climbed fence. Restless. Impulsive</p> | <p>Physical signs and symptoms.</p> <p>"Quick lifeless speech." Palilalia. Stutters. No facial signs of animation. All movements slow and deliberate. Contracted sluggish pupils. Blepharospasm. General spasticity. Tremor R. hand.</p> |
| <p>No. 10. Measles in infancy. No history of E.L. Certified as M.D. and admitted to R.S.I. at 17½. Diagnosed P.E.L. two years later</p> | <p>Charged with malicious wounding at 9. Fits of screaming, kicking, biting, throwing objects, smashing and destructiveness. Steals. Climbed fence. Restless. Impulsive</p> | <p>Loss of facial expression. Slurring of speech. Loss of motor control. Sluggish pupils. Tremor of eyelids. Spastic R. arm and leg. Tremor of R. arm and leg. Some wasting of R. thigh and calf. Reflexes ++. R. plantar extensor.</p> | <p>Drowsiness in daytime. Wakefulness at night. Parkinsonian facies; slow and expressionless. Irregular pupils; fail to react to light. Ataxia.</p> |
| <p>No. 11. No history of E.L. Certified M.D. at 23½. Admitted R.S.I. at same time. P.E.L. condition gradually increased from 29 when it was first noted.</p> | <p>Five convictions for bestiality, indecent behaviour, exposure and assault. Interfered with little girls. Throws objects, bites, gambles and absconded twice. Defiant, restless, often unsettled. Smashed. Paranoid</p> | <p>History of absconding. Maniacal outbursts. Wandering. Attacks of violence and destructiveness. Homosexuality. Male prostitute. Swallowed foreign bodies. Self-injury. Attempted suicide. Resistive. Precipitation to floor. Hiding on fire escape. Attacks of screaming and shouting</p> | <p>Fainting attacks. Slurring of speech. Tremor R. arm (on admission). Affected both arms five years later. Two years afterwards showed wasting and weakness of R. arm, with spasticity of both arms and legs, and increased reflexes.</p> |
| <p>No. 12. No history of E.L. Backward from birth. Certified and admitted to R.S.I. at 18½. Diagnosed P.E.L. on admission</p> | <p>Four convictions for stealing and assaulting a girl. Suicidal attacks and depression. Paranoid. Destructive to windows. Homosexual. Ab-sconded</p> | <p>On admission, noted as fidgety, restless, with poor motor co-ordination and tremor of L. hand and Rombergism. Seven years later: Coarse tremor of all muscles, worse on excitement. Unequal eccentric pupils. Scoliosis to R. Drowsy in daytime. Sialorrhoea. Fainting attacks with precordial distress.</p> | <p>Loss of facial expression. Slurring of speech. Tremor of motor control. Sluggish pupils. Tremor of eyelids. Spastic R. arm and leg. Tremor of R. arm and leg. Some wasting of R. thigh and calf. Reflexes ++. R. plantar extensor.</p> |
| <p>No. 13. No history of E.L. Backward from early age. At special school for eight years. Certified M.D. and admitted R.S.I. at 20½. Diagnosed P.E.L. at 27</p> | <p>Four convictions for stealing a cycle. Four unprovoked assaults on women. Attacked mother and sister with a knife. Maniacal outbursts. Impulsive. Absconds. Homosexual. Destructive. Stole hymn books, prayer books and a dictionary from the Institution</p> | <p>On admission, noted as fidgety, restless, with poor motor co-ordination and tremor of L. hand and Rombergism. Seven years later: Coarse tremor of all muscles, worse on excitement. Unequal eccentric pupils. Scoliosis to R. Drowsy in daytime. Sialorrhoea. Fainting attacks with precordial distress.</p> | <p>Loss of facial expression. Slurring of speech. Tremor of motor control. Sluggish pupils. Tremor of eyelids. Spastic R. arm and leg. Tremor of R. arm and leg. Some wasting of R. thigh and calf. Reflexes ++. R. plantar extensor.</p> |
| <p>No. 14. No definite history of E.L. but diagnosed as such before certification and admission to R.S.I. at 14½. Admitted from Home Office School. I.Q. 100 per cent.</p> | <p>Four unprovoked assaults on women. Attacked mother and sister with a knife. Maniacal outbursts. Impulsive. Absconds. Homosexual. Destructive. Stole hymn books, prayer books and a dictionary from the Institution</p> | <p>On admission, noted as fidgety, restless, with poor motor co-ordination and tremor of L. hand and Rombergism. Seven years later: Coarse tremor of all muscles, worse on excitement. Unequal eccentric pupils. Scoliosis to R. Drowsy in daytime. Sialorrhoea. Fainting attacks with precordial distress.</p> | <p>Slight tremor R. hand and foot. Voracity. Double incontinence. Myopic.</p> |

- | No. | Previous history. | Psychopathic symptoms. | Physical signs and symptoms. |
|-----|---|--|---|
| 15. | Certified M.D. and admitted R.S.I. at 14½. No history of E.L. Diagnosed P.E.L. on admission | Violent to mother. Threatened father. Indecent exposure. Asked girls to expose themselves. Beggar. Persistent demands for attention. Sly. Homosexual. Provokes others | Blepharospasm. Facial tics. General muscular tremors. Dorsal lordosis and scoliosis. Monotonous speech. Paralysis and spasticity of L. leg. Absent knee-jerk (R.). Nocturnal incontinence. |
| 16. | Certified M.D. and admitted to R.S.I. at 14½. No history of E.L. Diagnosed P.E.L. on admission | Stole a cycle and other articles. Frequently destructive. Homosexual. Noisy, restless, violent to other children. Deliberately soiled his room | Pallialia. Irregular R. pupil. Tremor R. forearm. Diminished R. knee-jerk. Frequent falls (ataxia). Urinary incontinence. Frequent bouts of fever. Liable to labial herpes. |
| 17. | Shrapnel wound in war—1918. Began with "nerves" at 16. No history of E.L. Certified M.D. at 21½. In 1927. Diagnosed P.E.L. 14 years later and admitted to R.S.I. | Five convictions for begging and drunkenness; two for stealing. Homosexual. Depression. Self-injury. Paranoid. Grandiose. Says he has a piece of iron in his head. Hallucinated. Obsessed by the idea of post-mortems | Advanced Parkinsonism with oculo-gyric crises, rigidity of legs, tremor of eyelids, tongue, hands and feet. Monotonous speech. Sialorrhoea. |
| 18. | No history of E.L. Certified and admitted to R.S.I. at 21½. Illiterate. Diagnosed P.E.L. on admission | Conviction for indecent assault. Outbursts of temper and violence. Homosexual and masturbator. Tried to abscond. Confusional attacks with disorientation. Self-injury. | Retardation of speech. Sialorrhoea. Gaping mouth. Parkinsonian facies. Inco-ordination, rigidity and tremor of forearms. Lethargy. "Epileptoid" attacks. Chronic otitis media. |
| 19. | No history of E.L., though conduct disorders were noted at 15. Certification and admission to R.S.I. at 18½. Diagnosed as P.E.L. at 28 | Ten convictions for indecent assault on girls, sexual misconduct with males and animals, and stealing. Indecent exposure. Masturbator. Violent—throws objects. Smashes. Suicidal | Twelve years after admission first noted as showing signs of Parkinsonism. Now has small sluggish pupils, right-sided hemi-Parkinsonism with rigidity and tremor. Tremor of L. hand. Coarse fixed facies. Chronic otitis media. |
| 20. | No history of E.L. In the army at 17. At two mental hospitals before certification as M.D. and admission to R.S.I. at 28. Diagnosed as P.E.L. for first time at 36½ | Five convictions—three for stealing, one for indecency, and one for assaulting mother. Violent outbursts—fighting and throwing stones; hypomania. Stole food; begged; pestered patients and staff. Homosexual. Marked addiction to tobacco | Sluggish pupils. Polypnoea. Rapid onset of Parkinsonism a year after diagnosis of P.E.L. |
| 21. | No history of E.L. Had had many situations in employment, and was discharged from the army as an "anxiety neurosis." Certified M.D. at 18 and admitted to R.S.I. at 18½, though I.Q. was assessed at 90 per cent. Diagnosed P.E.L. a year after admission | Two convictions for indecency to small boys. Homosexual pervert. Slovenly, untidy; very persecuted. Depression. Absconder | Diagnosed by Sir Arthur Hall as a P.E.L. with butterfly tremor of lids, unequal pupils, and salivation. |

- No. Previous history.
22. No history of E.L. Certified M.D. at 19½. Admitted to R.S.I. at 20. Only reached standard IV at school. Did not learn to write. History of "fits" in first year. Never worked. Diagnosed P.E.L. at 29½
23. No history of E.L. Certified M.D. at 18. Admitted to R.S.I. at 19½. Diagnosed P.E.L. at 21½
24. No history of E.L. Certified M.D. at 7. Admitted R.S.I. at 13½. Imbecile grade. Diagnosed P.E.L. at 17 years 5 months
25. Premature at birth. 5 lb. at birth. M.D. from infancy. No history of E.L. Certified M.D. at 12. Admitted to R.S.I. at 17
26. No history of E.L. Certified M.D. and admitted R.S.I. at 13½. Never went to school. Imbecile grade. Diagnosed P.E.L. at 25
27. Parents convicted 30 times of neglect to children. Never went to school. Illiterate. No history of E.L. Certified M.D. at 14½. Admitted to R.S.I. at 14½. Diagnosed P.E.L. at 27 after readmission
- Psychopathic symptoms.
- Morbid attacks of fear; strikes out impulsively. "Talkative and morose" in turns. Delusions of impending death. Attacks of screaming and excitability. Throws objects about. Destructive. Homosexual. Agoraphobia. Is solitary because he knows he might strike out
- Impulsive outbursts of striking. "Epileptoid" attacks; attacks of blankness, without loss of consciousness, flushing of face, vertigo and vomiting. Homosexual. Threatened suicide. Set fire to paper in the ward dayroom
- Violent attacks—bites others and himself. Bangs his head on the wall and door. Shouts that he is going mad. Wishes he were dead. Asks others to hit him. Tried to abscond. Destructive to light shades and electric bulbs
- Steals, wanders, out late at night. Aimless, impulsive, solitary, destructive, teases other patients. Kicks, bites, scratches. Homosexual and masturbator
- Aimless wanderer; stripped himself in the street. Ran away from home. Turned on gas and water taps mischievously. Violent to other children. Smashes. Throws food at attendants. Spits. Masturbator
- Convictions for arson, sodomy, theft and rape. Tried to abscond. Roof-climber. Gambler. Fighter. Bully. Smashes
- Physical signs and symptoms.
- Hypospadias. Sexual under-development. Increasing muscular hypertonia. Manneristic. Grimaces. Restless movements. Lethargy. Stays in bed for days at a time.
- Slow slurred speech. Sialorrhoea. Nystagmus of eyelids. Flexion posture. L. hemi-paresis with spasticity. Immobility of L. facial muscles. Eunuchoid build (hairless). Genu valgum.
- Parkinsonian facies. Increased muscular tonus and tremor L. arm. Staring and infrequent blinking. External strabismus. Upward nystagmus. Ataxic gait. Walks on broad base. Defective and slurred speech.
- Restless and fidgety. Internal strabismus. Paresis of R. face, arm and leg, with some wasting, more in arm than in leg. R. extensor plantar and knee-jerk ++. R. chest moves less than L. Tremor of eyelids. R. hemi-anaesthesia—cigarette burns R. face. Sialorrhoea. Frequent falls (ataxia). Spastic gait.
- Parkinsonian facies. Spasmodic torticollis. Stooping and lurching gait. Scoliosis. Speech slurred and defective. Bilateral spasticity along with hyperextension and flaccidity of fingers. R. extensor plantar. L. facial tic. Double otitis media.
- Parkinsonian facies. Dull and slow in speech and general motility. Flat-footed.

No. Previous history.

28. Epilepsy from 6-10. No history of E.L. Can't read or write. Imbecile grade. Mother sent to prison for neglect. Immoral and alcoholic. Treated violently by parents. Certified at 16 years 11 months. Admitted to R.S.I. at 21½. Diagnosed P.E.L. at 39

29. M.D. from birth. Certified at 8. Admitted to R.S.I. at 13 years 10 months. Imbecile. Diagnosed P.E.L. at 25

Females.

1. Certified M.D. at 19½. Admitted to R.S.I. at 20½. Imbecile. Diagnosed P.E.L. on admission

2. No history of E.L. Certified M.D. at 16½. Admitted to R.S.I. at 16½. Diagnosed P.E.L. at 22½

3. No history of E.L. Certified M.D. at 16. Admitted to R.S.I. at 19½. Diagnosed P.E.L. at 25½

4. No history of E.L. Certified M.D. at 21½. Admitted to R.S.I. at 21½. I.Q. 98 per cent. Diagnosed P.E.L. at 33

Psychopathic symptoms.

Restless. Threw plant-pots about at night. Destructive to clothing and windows. Violent attacks of striking and kicking. Precipitated himself on the ground. Threw faeces through the window. Impulsive. Agitates and pesters others. Homosexual. Paranoid

Destructive from 6. Very impulsively violent. Set fire to himself from a lamp. Excitable and restless. Ran away from home. Attacks of alternate laughing and crying. Absconded twice. Hides himself. Urinates on floor deliberately. Injures himself. Tried to cut his throat. Rectal masturbator

Pilferer; beggar. Restless, noisy. Jumped out of window; ran away from home. Broke through panel of door and escaped from it. Threw objects. Smashed windows. Destructive to blankets. Injures herself by rubbing skin with a blanket. Attacks of confusion. Fell out of bed

Convictions for theft and assault. Contracted V.D. before 16. Wanders. Absconds. Impulsive attacks of violence. Stuck a needle in her breast. Agitates

Convicted of "false" pretences for money. Threw herself down a flight of stairs. Wanders. Absconds. Makes false accusations. Suicidal. Smashes. Agitates others. Injures herself with needles. Tied her neck up four times. Depression. Fainting attacks when she is anaesthetic. Hypochondriac

Conviction for stealing in 1925. Sent to Home Office School. Had an illegitimate child in 1931. "Can't leave men alone." Always defiant and obstinate. Worse after 1923. Attacked mother and sister. Makes violent sexual attacks on staff. Delusions of persecution

Physical signs and symptoms.

Fixed Parkinsonian facies. Sialorrhoea. Stares. Dilated sluggish pupils. Bilateral optic atrophy. Staccato and precipitant speech. Coarse tremor of hands and of legs. Pill-rolling movements of hands. General loss of sensory acuity. Pes cavus. Genu valgum. Serological evidence of syphilis.

Fixed Parkinsonian facies. Salivates. Very hesitant and defective speech. Springy gait. Drooping jaw. Sexually under-developed at 25.

Parkinsonian facies. Slowness of movements; R. more affected than L.

Parkinsonian facies. Poverty of movement. Frequent falls.

Oculo-gyric attacks lasting for some days, alternating with vertigo and suicidal turns. Fixed facial expression. Stares blankly. Slight tremor of hands. Occasional internal strabismus.

Parkinsonian facies. Drooping jaw. Recurring dislocation of shoulder.

- No. Previous history. Psychopathic symptoms. Physical signs and symptoms.
5. Doubtful history of birth injury; attributed by parents to air raids. History of measles and whooping-cough. Certified M.D. at 15½. Admitted to R.S.I. at 20½. Diagnosed P.E.L. at 24
6. Doubtful birth injury. Defective from an early age. Illiterate. Imbecile grade. Certified M.D. at 7½. Admitted R.S.I. at 15½. No illnesses. Diagnosed P.E.L. at 24
7. No history of E.L. Certified M.D. at 16½. Admitted to R.S.I. at 16½. Diagnosed P.E.L. at admission
8. *Attributed to ill-treatment by father of mother in pregnancy. No history of E.L. Certified M.D. at 28½. Admitted to R.S.I. at 31½. Diagnosed P.E.L. at 33½
9. No history of E.L. M.D. from 4. Certified at 19½. Admitted to R.S.I. at 21½. Frequent employments. Diagnosed P.E.L. at 27
10. No history of E.L. Certified and admitted to R.S.I. at 14½. Diagnosed P.E.L. at 19½ on readmission
- Fits of rage if not given her own way. Attacks children. Hides. Tried to abscond, and ran in front of motor cars. Fits of weeping. Smashes. Threw objects. Voracious eater. Pestors others
- Restless; violent attacks in which she strikes or bites. Ran away from school. Throws stones. Destructive to clothing. Impulsive and noisy. Soils and wets herself. Masturbates openly. Injures herself
- Throws objects. Steals. Tried to get out of bathroom window to run away. Threatened to climb roof. Bites and strikes. Destructive to clothing. Openly masturbates. Makes false accusations
- Impulsive. Absconds. Thief. Immoral. Smashes. Liable to depression. Injures herself.
- Two convictions for stealing. Sent to Industrial School at 18 years 10 months. Ran away from home. Wanders. Absconded. Out late with men. Had an illegitimate child at 20. Depressed. Violent attacks. Attempted suicide. Smashed. Masturbator. Obscene
- Convicted for stealing at an early age. At an approved school. Runs away from home. Romancer. Injures herself.
- Physical signs and symptoms.
- Epileptoid attacks. Restless. Blepharitis. Marked Parkinsonian facies. Slurred speech. General muscular rigidity. Lethargy.
- Tics of shoulder and face. Grimaces. Parkinsonian facies.
- Fixed facial expression. Paresis and atrophy of L. arm and L. leg with rigidity. Scoliosis. Speech monotonous. Tics of shoulder, neck and face. Spastic gait.
- Immobile features. Excessive somnolence. Lies down in the ward in daytime to sleep.
- Oculo-gyric attacks from age 26. "Eyes stuck up" in the evenings.
- Fixed Parkinsonian facies.

From the evidence presented by the above cases and others of the series the following tentative conclusions are suggested :

(1) The post-encephalitic state may follow in the course of an acute infectious disease known as epidemic encephalitis. This state may follow shortly after the acute illness, or it may follow much later, and not be diagnosed as the chronic Parkinsonian state for many years after.

(2) The Parkinsonian state or other post-encephalitic syndromes may follow an encephalitis after any of the acute fevers or vaccinia.

(3) Although it is often assumed that a post-encephalitic state must have been due to an acute illness of epidemic encephalitis, cases of this series suggest that it may also be associated with meningitis, chorea, epilepsy, infantile hemiplegia (with or without birth injury), acute anterior poliomyelitis, or cerebral trauma.

(4) It may occur *de novo* as a slowly progressive disease, either following or coincident with mental deficiency. (Grinker, *Neurology*, p. 708.)

(5) There is some evidence that some cases are caused by sepsis of the nasal sinuses or of the middle ear.

(6) There is some susceptibility of the patients to herpes ; this may or may not be causative of a post-encephalitic state, but Levaditi and Harvier are of the opinion that it is an important cause. (Grinker, *Neurology*, p. 703.)

(7) Congenital syphilis occurs in some cases, and this may be an aetiological factor in the causation of Parkinsonism. (See W. R. Brain's *Diseases of the Nervous System*, 1933 edition, pp. 408, 445 and 455.)

(8) A few cases gave a history of "sunstroke" as the original cause of the acute illness. Exposure to sun, heat, and fatigue, both physical and mental, have long been considered important contributory factors in bringing on the form of encephalitis known as Japanese B encephalitis. Naka and his associates (quoted in No. 3 Report of the Matheson Commission on Epidemic Encephalitis, Columbia University Press, 1939, p. 167) gave physical exertion in hot sun as the immediate cause of the attack in 74 per cent. of cases.

THE SOCIAL BACKGROUND OF THE POST-ENCEPHALITIC.

In this present age of social medicine it is not surprising that we should find that in common with many other diseases the post-encephalitic is suffering, not merely from an organic disease of the brain, but also from a "disease" of his social milieu.

There can be no doubt that the post-encephalitic exhibits violent and dangerous propensities, not merely because of his cerebral disease, but also because his environment both cramps and distorts his potential development. We may illustrate this by comparing our present series of 275 cases with the environmental factors found in a series of 262 violent and dangerous juvenile defectives under the age of 16.

Bearing in mind the inadequacy of information about the different factors listed among the environmental predisposing causes, it is probable that the post-encephalitic is less liable to belong to a defective family than the ordinary defective, but the history of defectiveness in the family in 23 cases must bear some relationship to his mentally defective constitution.

Environmental factors.	Post-encephalitic group.	Juvenile defective group.
1. Family history of mental defectiveness	23 (8.4%)	56 (21.3%)
2. Family history of insanity	30 (10.9%)	25 (9.5%)
3. " " of invalidism	46 (16.7%)	35 (13.3%)
4. Poor economic circumstances	39 (14.2%)	54 (20.6%)
5. Overcrowding	17 (6.2%)	28 (10.7%)
6. Living in slum conditions	28 (10.2%)	11 (4.2%)
7. Illegitimacy	17 (6.2%)	32 (12.1%)
8. Orphanism	104 (37.8%)	106 (40.4%)
9. Parental lack of control	7 (2.5%)	7 (2.7%)
10. Influence of maternal anxiety	3 (1.1%)	9 (3.2%)
11. Prison record in family	6 (2.2%)	9 (3.2%)
12. Parental alcoholism	16 (5.8%)	21 (8%)
13. Immorality of one or other parent	18 (6.5%)	20 (7.6%)
14. Syphilitic parentage	1 (0.4%)	7 (2.7%)
15. Other causes	51 (18.5%)	13 (5.0%)

Insanity, apparently, bears approximately the same relationship to the post-encephalitic group as it does to the generally defective group.

Invalidism presents a relatively more important relationship to the post-encephalitic than to the other defective group. Included in the figure 46 are 18 cases in which neurosis was present in one or other of the parents, 26 cases in which one parent suffered from chronic ill-health, and 7 with a family history of tuberculosis.

Overcrowding and poor economic circumstances appear to be an important associated condition in the post-encephalitic group, though not to the same extent as in the juvenile defective group.

Illegitimacy is approximately half as prevalent in the post-encephalitic group as in the juvenile defective group.

The high incidence of orphanism in some form or other appears to be of equal significance in both groups. The condition of orphanism includes such factors as :

1. Death of one or both parents.
2. Separation of both parents from whatever cause.
3. Upbringing by foster-, step-, or grandparents.

If we try to analyse the relative importance of father or mother, we find that among the males 51 were handicapped by lack of paternal control and 45 by lack of maternal influence, while among the females 52 were lacking in paternal control and 26 in maternal.

The other factors, such as maternal anxiety, prison record in family, alcoholism, syphilis and parental immorality, are of less importance in the post-encephalitic group as compared with the juvenile group.

Other factors which appear to be of some importance in the post-encephalitics are the size of the family.

The post-encephalitic very frequently has a marked inferiority sense which may undoubtedly be aggravated by the physical and mental residua of his disease, but it is also apparent that he suffers from a strong feeling of inferiority as compared with other members of the family.

Of the social classes, by far the largest proportion of the patients came from mining families. These include 16 out of the whole group.

The Course of the Post-encephalitic State.

The progress of the post-encephalitic state, as revealed by the study of the 275 patients admitted to Rampton, is disappointing.

In the males their progress is briefly summarized :

Still remaining at Rampton	108
Slight improvement permitting transfer to Moss Side (a sister institution to Rampton for slightly less violent and dangerous patients)	14
Showing improvement enough to warrant transfer to certified institutions	9
Improved to allow for transfer on licence	1
Discharged from the Mental Deficiency Acts	4
Transferred to mental hospitals	3
Dead	29
Total	168

In the females the corresponding series of figures is :

Still at Rampton	59
At Moss Side	11
Other certified institutions	14
Mental hospital (of whom one was first allowed home on licence, and then went into a mental hospital)	4
Dead	19
Total	107

In view of the difficulty of following up cases after they leave Rampton, little can be said of their subsequent course, but the total of 28 out of 275 to certified institutions, and on licence and final discharge, cannot be considered a very large proportion (10·2 per cent.), though in keeping with other observations (physical effects and social consequences) it appears to be evident that the males fare worse than the females (ratio of 8·3 per cent. : 16·8 per cent.).

As far as morbidity is concerned the post-encephalitic sometimes slowly deteriorates both physically and mentally, and appears to flicker out like a light in the night. In these cases the pathological process may be likened to the degenerative changes that cause death in Schilder's encephalitis, or Pick-Alzheimer's pre-senile dementia. It is more usual, however, for death to be caused by other pathological effects.

In the total of 48 deaths (29 males, 19 females) the causes assigned may be summarized :

1. Progressive dissolution and deterioration without other assigned causes	4
2. Suicide	4
3. Acute confusion	1
4. Bulbar palsy	3
5. Pituitary cachexia	1
6. Acute haemorrhagic pancreatitis	2
7. Heart conditions, including fatty myocarditis, atrophic heart, coronary atheroma, malignant endocarditis	5

8. Respiratory conditions:	
Asphyxia in a fit	1
Croup	1
Lobar pneumonia	6
Broncho-pneumonia	4
Pulmonary tuberculosis	6
9. Septic conditions:	
Septicaemia and pulmonary abscess	1
Cellulitis of face (pustule of nose)	1
Perforated duodenal ulcer	1
Intestinal perforation (traumatic)	3
Ulcerative colitis	1
Renal abscess	1
Pyelitis	1
10. Malignant disease:	
Carcinoma of cervix	1

SUMMARY.

1. A study of 275 post-encephalitics is presented, based on the cases admitted to Rampton State Institution as violent and dangerous mental defectives.
2. Of 208 cases in which the date of onset is given, 90 occurred in the years 1923, 1924 and 1925.
3. The largest number of admissions in any one year was in 1930, when 43 cases were admitted, but the remaining years between 1929 and 1939 showed a fairly steady admission rate of 14-19 per year. Cases are still being admitted, though in smaller numbers.
4. Whereas the peak years for onset of encephalitis lethargica were 1923 and 1924, the peak years for certification were the five years between 1928-1932.
5. Admissions came from a wide variety of institutions, but those from certified institutions for mental defectives comprised the largest number.
6. Sex incidence is discussed.
7. The effect of encephalitis on mental development is indicated by illustrative cases.
8. Head measurements indicate that encephalitis tends to be associated with shorter head lengths and wider head breadths than those of the average general hospital population.
9. Consideration is given to the incidence of psychotic symptoms, and particular reference to confusional states indicates the importance of the parent-child relationship.
10. The psychopathic effects of the post-encephalitic state are considered in relation to mental grade.
11. Neurotic symptoms following encephalitis are outlined.
12. 30 cases are described in which trauma appears to have played some etiological part.
13. 57 cases without gross Parkinsonism are summarized, especially from the point of view of behaviour disorders.
14. 39 cases of Parkinsonism without definite histories of acute encephalitis are outlined.

15. A summary of the social background of the post-encephalitic is presented.

16. An outline of the course of the condition in the complete series, along with the terminal cause of death in 48 cases, is given.

I am indebted to the Chairman of the Board of Control for permission to use the case material of Rampton State Institution for publication, although the Board of Control cannot take any responsibility for any of the statements contained herein.

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CONTINUOUS NARCOSIS: THE ADVANTAGES OF ORAL SOMNIFAINE—A COMPARISON.

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CONTINUOUS narcosis is a method of treating psychiatric conditions by producing a state of narcosis or intoxication for a prolonged period. It was first adopted seriously by Klaesi (1921), and has proved to be a valuable therapeutic weapon. Klaesi used large doses of somnifaine by intramuscular injection, and these were repeated as often as was required to maintain unbroken sleep for 8-10 days.

The method was introduced into this country by Dawson and Barkas (1926), but following the original technique, alarming complications and fatalities were met with. Strom-Olsen (1933) introduced insulin in combination with glucose, and claimed a greatly increased safety with this technique. However, Palmer (1937) and Parfitt (1936) and Gillespie (1939), in a review of the literature up to that time, concluded that the avoidance of complications was more a matter of experience and vigilance than of using any adjuvant.

Meerloo (1933) was the first to draw attention to the underlying cause of the alarming complications and fatalities which resulted from this treatment. He pointed out the increased susceptibility of certain patients to the barbiturates, and placing the emphasis on the intoxication produced, proceeded to bring this about by easy stages, thereby allowing idiosyncrasy to show up before too large doses have been given. He also suggested that the process of dis-intoxication may be a factor in producing results.

In this paper it is proposed to describe two series of cases treated with somnifaine. The first series consists of cases treated by intramuscular injections between 1936-1940. Part of this series has already been described by Menzies (1937). The second consists of cases treated by the oral method between 1943-1946.

Continuous narcosis, using somnifaine orally, has received scant attention. Hennelly (1936) tried it, and finding it more toxic, reverted to the injection method. It is not clear which solution he used, but the intramuscular solution cannot be used orally, as it quickly causes nausea and vomiting due to direct action on the stomach.

The experience gained by the oral method has been so favourable that it deserves to be recorded.

Somnifaine is a water-glycerin-alcohol solution of the diethylamine salts of two dialkyl-barbituric acids, each c.c. containing 0.1 gm. of diethyl-barbituric acid (barbitone) and 0.1 gm. of allyl-isopropyl-barbituric acid. The oral solution contains aromatic flavouring essences. The intramuscular solution is made up in 2 c.c. ampoules and contains a small quantity of local anaesthetic.

SERIES NO. 1.

By Intramuscular Injection.

The drug is introduced by gradually increasing doses until a state of intoxication is produced, and this state is maintained for 10-14 days. There is a gradual withdrawal at the end of treatment so as to reduce the risk of withdrawal seizures.

A thorough physical examination of the patient has been made and organic disease excluded. The patient is nursed in an open ward.

The following notes on the nursing and management of somnifaine narcosis were displayed for the guidance of the nurses :

"The object is to produce prolonged drowsiness and sleep. The patient is awakened at regular intervals for feeding, toilet, etc. The patient must be under constant observation. Somnifaine is given as recommended by the physician. Symptoms of intoxication to be expected—the patient is limp, ataxic, unable to articulate properly, and has difficulty in swallowing. Vomiting, pyrexia, retention of urine or oliguria may occur, especially in the early stages.

"*Important points in nursing.*—(1) Four-hourly charts must be kept of temperature, pulse and respiration. A rise in temperature to 99° F. or over is a signal to suspend the treatment by omitting one or two doses of somnifaine. Increased pulse rate to 85 or over should be reported and treated as for pyrexia. (2) The 24 hours' urine must be measured and a specimen sent to the laboratory each morning. (3) A record must be kept of the amount of liquid (milk, etc.) consumed by the patient daily. (4) The patient must be raised at regular intervals and assisted on to the commode. Bed pans must not be used. (5) When taking food and liquids the patient must be supported in an upright position. Two nurses may be required if the patient is very limp. Care must be taken that the patient does not choke, and as a rule spoon feeding is required. (6) Diet : Ample nourishment is essential. As far as the patient can swallow, solids, semi-solids and liquids are given. In addition to the ordinary diet, three pints of milk with glucose, one tablespoonful to each glass of milk, must be given. The patient should take about 5 pints of liquid in the 24 hours. (7) Bowels : Simple enema to be given on each third day.

Important Points to Watch.

"(a) That the patient does not roll or fall out of bed.

"(b) That he or she is upright when feeding and is fed slowly.

"(c) Temperature and pulse rate."

Treatment.—On the 1st, 2nd and 3rd days 2 c.c. somnifaine are injected deeply into the gluteal or lateral thigh muscles at 2 p.m., after the patient's dinner. On the 4th day a second injection of 2 c.c. is given about 7 p.m., after the patient's supper. This is continued on the 5th, 6th and 7th days.

The depth of narcosis will, by this time, have required attention.

On the 8th day, if the patient is not sufficiently drowsy, a third injection of 2 c.c. is given at about 9 a.m., after the patient's breakfast. The majority of patients take this amount, i.e. 6 c.c. in the 24 hours. A few, however, require 8 c.c., and in these cases, on the 10th or 11th day a further 2 c.c. is

given—either as an extra dose at 7 a.m., after an early breakfast, or it may be added to the midday dose, making this 4 c.c.

If there is great restlessness, and this occurs mainly in the induction period, paraldehyde in 2-drm. doses may be given.

Atropine sulphate gr. $\frac{1}{100}$ was used to control vomiting.

Two hundred and thirty-three treatments were carried out on 212 patients—21 had a second course. Forty-eight treatments had to be stopped because of complications. These were rarely alarming, and it would be more correct to say that treatment was abandoned because of a risk of more serious trouble. It soon became evident that, in the majority of those cases who failed to complete the treatment because of complications, the part of the treatment already completed showed an unsatisfactory course from the beginning.

In eight cases treatment was ended prematurely for various other reasons.

Complications.—The following, with the number of cases in brackets, occurred: Pyrexia (100), vomiting (44), difficult, resistive and refusing food (7), tachycardia (5), rash (3), too drowsy, with nystagmus or other toxic signs (3), abscess at site of injection (2).

In 177 completed treatments the following facts were noted: The total period of treatment averaged 21.8 days. After deducting 8 days for induction and withdrawal, the period during which the patient was under full narcosis averaged 13.6 days, and for this period the average daily dose was 5.3 c.c. somnifaine. To be more specific, 162 cases had 6 c.c. for 9 days, 11 cases had 8 c.c. for 2 days, and only 4 cases completed treatment on 4 c.c. daily.

Paraldehyde was given to 109 cases, with an average of 8 doses per case.

Sleep averaged 14.1 hours in the twenty-four.

Weight.—Ninety-four cases showed an increase, averaging 5.5 pounds. Thirteen cases showed a decrease, averaging 3 pounds.

Table of Results. All Cases included whether Treatment Completed or Not.

Diagnosis.	Recovered.	Relieved.	Not improved.	Total.
Schizophrenia .	14 (31.8%)	5 (11.4%)	25 (56.8%)	44
Paraphrenia .	5 (17.8%)	4 (14.3%)	19 (67.8%)	28
Melancholia .	83 (67.0%)	17 (13.7%)	24 (19.3%)	124
Mania .	12 (80%)	1 (6.7%)	2 (13.3%)	15
Anxiety states .	4 (50%)	4 (50%)	0	8
Other neuroses .	0	2 (66.7%)	1 (33.3%)	3
Confusional states .	6 (86%)	0	1 (14%)	7
Mixed states .	2 (50%)	1 (25%)	1 (25%)	4
Totals .	126 (54.1%)	34 (14.6%)	73 (31.3%)	233

Observations.—At first paraldehyde was used to ensure sleep, but later was used only to calm restless, excited patients, and prevent them from interfering with their own or their neighbours' treatment.

Transient glycosuria occurred in 62 cases, but had no significance. It may be attributed to the sudden increase in glucose intake.

Epileptiform seizures occurred in 13 cases within 48 hours of the end of treatment. These fits cannot be related to the cerebral irritation met with during treatment by McNiven (1936). Kalinowski (1942) suggested that for each anti-convulsant drug there is a specific time interval between withdrawal and the occurrence of the fit, and this interval bears a close relation to the rate at which the drug is eliminated from the system. He was, however, referring to chronic cases, and did not believe that fits occurred after acute intoxication. There was nothing of significance to be noted during treatment in these cases.

There were no deaths. Hennelly (2) (1936) and McCowan (1936) reported safe treatments, but rarely used more than 4 c.c., using quiet and darkness, and, if necessary, paraldehyde to produce sleep. It may be doubted whether sleep under these conditions represents true narcosis. In the cases described in this paper it is held that though the patient may not be actually asleep, he or she is still under narcosis, and there is no true revival of thought or feeling as in a waking period. For the same reason I have preferred to call the treatment "continuous narcosis."

Strom-Olsen (2) (1933) stated that the average effective dose was 5-6 c.c. daily.

SERIES No. 2.

Somnifaine by the Oral Method.

Though somnifaine narcosis has been accepted as a valuable method of treatment, alternative drugs have been sought. However, somnifaine remains the most effective and appear to be as safe as any other drug or combination of drugs. Wilson and Gillman (1938) used a medinal-luminal combination, but had alarming complications and two deaths in 60 cases. They used insulin in combination. Brody (1940), using paraldehyde and dial, succeeded in producing prolonged narcosis, but had two deaths in 90 cases. Horsley (1937) used soneryl. He aimed at continuous sleep, and found that though this was rarely achieved, the results were almost as good. He concluded that it was safer, though less effective, than somnifaine.

Staffing difficulties during the war suggested the oral method and its advantages soon became evident.

One hundred and forty-three treatments were carried out on 120 patients—23 patients had a second course.

The principle of treatment is the same—to produce a state of intoxication by gradually increasing doses, and to maintain this state for a prolonged period. There is a gradual withdrawal.

Patients are nursed in an open ward, and when the weather is fine and warm they are wheeled on to an adjacent verandah for the greater part of the day.

Cases with organic disease are excluded, and particular attention is paid to the state of the cardio-vascular system.

The dose is measured in a graduated 1 c.c. or 2 c.c. syringe—larger syringes should not be used—and given in 1-2 ounces of milk or water, at regular intervals.

On the 1st day a dose of 1 c.c. or 1.5 c.c., according to the general impression

of physical fitness of the patient, is given at 7 p.m., after the patient's supper.

On the 2nd day two similar doses are given—at 2 p.m., after the patient's dinner, and at 7 p.m.

On the 3rd day three similar doses are given, at 9 a.m., after the patient's breakfast, at 2 p.m., and at 7 p.m.

Three doses only are given on any day, and further increases are made by increments of 0.5 c.c. No variation of this increment was allowed.

The depth of narcosis will now require attention.

On the 7th day, if all goes well, 0.5 c.c. is added to the morning and evening doses, and on the 8th day, 0.5 c.c. is added to the midday dose. According to the size of the starting dose, it will now appear the patient is receiving 4.5 c.c. or 6 c.c., but modifications may be made in the lower doses, if required. In this way a patient who is not showing adequate narcosis on three 1 c.c. doses may, on the 5th day, have 0.5 c.c. added to the morning and evening doses and, on the 6th day, have 0.5 c.c. added to the midday dose. On the 8th day a further 0.5 c.c. may be added to the morning doses, and on the 9th day 0.5 c.c. added to the midday dose.

In this way all patients should be under full narcosis and have reached their maximum dose by the 8th or 9th day. A few cases show a slight revival in a few days, and require a further 1 c.c. or 1.5 c.c. to keep them fully under.

The following data were derived from the series treated:

Duration.—Average total period of treatment was 20 days. Average period of full narcosis was 15 days.

Amount.—Average dose for period of full narcosis was 5 c.c. daily. The largest amount given was 7.5 c.c. daily. The state of intoxication was the deciding factor in recommending dosage.

Weight.—Increase in 40 cases—average increase 4.6 pounds. Decrease in 11 cases—average decrease 2.5 pounds.

It may be mentioned that the amount of nourishment available in the past three years fell far short of that of pre-war years, and I believe that if sufficient milk and eggs had been available, there would have been a more striking improvement in weights.

Complications.—The almost complete absence of serious complications and the reduction in the incidence of minor complications has been the most noticeable feature of the oral method of somnifaine narcosis. Only 4 cases failed to complete treatment. Two of these were too restless and resistive and disturbing others. The third case was a man of 43 years who had some chronic bronchitis and showed respiratory embarrassment on the 4th day. He recovered completely in 24 hours. The fourth case was an asthenic woman of 42 years who, one month after a first course, and on the 8th day of her second course of treatment, developed a deep thrombo-phlebitis of the right leg. She recovered gradually but completely.

The only other serious complication was a similar thrombo-phlebitis in the right leg in a man of 63 years, four days after completing treatment. He also developed auricular fibrillation of the heart. He recovered gradually but completely.

A slow circulation rate due to prolonged immobility in bed constitutes an

important causal factor in spontaneous coagulation. Palmer (1939) first drew attention to this complication of somnifaine narcosis and recorded four cases.

Minor complications with number of cases were: Pyrexia (21), vomiting (9), toxic signs—nystagmus, diplopia (3). Epileptiform seizures occurred in 6 cases following treatment—within 48 hours in all cases except one who had a fit 6 days after treatment.

A feature of the oral method was, as a rule, the absence of the excitement and restlessness which was so common in the early stages of treatment by injection.

Paraldehyde: 66 cases had 2-drm. doses with an average of 6 doses per patient.

Table of Results.

Diagnosis.	Recovered.	Relieved.	Not improved.	Total.
Schizophrenia . . .	6 (16·7%) . .	8 (22·2%) . .	22 (61·1%) . .	36
Paraphrenia . . .	0 . .	2 (18·2%) . .	9 (81·8%) . .	11
Melancholia . . .	22 (55%) . .	10 (25%) . .	8 (20%) . .	40
Mania . . .	5 (62·5%) . .	3 (37·5%) . .	0 . .	8
Anxiety states . .	20 (66·7%) . .	6 (20%) . .	4 (13·3%) . .	30
Other neuroses . .	3 (33·3%) . .	3 (33·3%) . .	3 (33·3%) . .	9
Confusional states .	5 (100%) . .	0 . .	0 . .	5
Totals . . .	61 (43·8%) . .	32 (23%) . .	46 (33·2%) . .	139

In tabulating these results a strictly clinical assessment was made. Patients were considered to be recovered if they showed a return to normality directly after treatment and maintained this state so that they were recommended for discharge from hospital. In the "Relieved" group there are cases who also were discharged because of their improvement due to treatment, but in whose case a clinical recovery could not reasonably be claimed. In the third group there are a small number who showed a complete though temporary recovery from their symptoms. In at least two of these cases I was able to associate their relapse with extremely difficult home conditions which they were unable to face.

It will be observed that the results in the schizophrenic-paraphrenic group are not encouraging. They are particularly good in the mania, melancholia, anxiety and confusional states. Parfitt (1946), comparing prolonged narcosis and electro-convulsive therapy, concluded that the cure rates were about the same in schizophrenia, but not as good as those obtainable with insulin.

Continuous narcosis, using somnifaine, has much to recommend it as a form of treatment for mental illness. It offers a means to recovery to which few patients are likely to object, and provided the right principles are adopted and adequate nursing skill is available, the physician need have no fears as to its safety. There are no ill-effects from the treatment.

CONCLUSIONS.

Somnifaine narcosis, using the method of intramuscular injection, is a safe form of treatment provided it is produced gradually and provided that nursing and observation are good.

Somnifaine narcosis by the oral method is a considerable improvement on the injection method. The same dosage is employed, the narcosis is complete, and serious complications are rare. The patient is spared the ordeal of receiving up to 50 deep intramuscular injections, and the nurse has more time to devote to the nursing and observation of the patient.

The cardio-vascular system appears to be the most vulnerable to somnifaine.

If adequate doses are given a state of continuous narcosis is produced, and this state may be maintained with safety for about 15 days.

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TYPES OF NERVOUS SYSTEM IN MAN, THEIR HEREDITY AND EVOLUTION.

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THE theory concerning the various types of nervous system in man, generally acknowledged by Russian neurologists, is based on the principles established by Pavlov in his investigations on conditioned reflexes in dogs. It was Pavlov and his collaborators who succeeded in establishing that all variations in the nervous types of dog are due to three main differences. These differences may consist in varying intensity in the essential processes (excitation and inhibition), peculiar to the nerve cell of the cerebral cortex, with the result that some specimens are of a stronger, others of a weaker nervous type. There may also be differences in the degree of equilibrium attained between the two processes, with the result that some specimens are well balanced, while others are unbalanced. Finally the differences may consist in the rate at which the nerve cell is able to pass from one state to the other, in the rate at which the concentration of the excitation or inhibition process is reached after the primary phase of irradiation, and in the rate at which the excitation process becomes extinct within a cell after the action of the stimulus has ceased. As a result of these latter differences some specimens may be more mobile, others more inert. At the same time it was established that the differences with respect to all these three functions could develop independently of one another, owing to which fact the resulting typologic combinations are extremely varied.

The following four types are the most frequent: Strong alert and well balanced; strong alert, but unbalanced, the lack of balance being due to the inhibition process greatly lagging behind that of excitation; strong, balanced, but inert; and the type characterized by a weakness of both the excitation and the inhibition processes. Weak and unbalanced specimens, while subjected to the formation of such conditioned reflexes as proved to be too great a strain on their nervous system, were precisely the ones which most readily developed complex dynamic breakdowns, or the so-called experimental neuroses, that have been studied in detail by Pavlov and his school (M. K. Petrova and others). It was also found in the course of these investigations that such breakdowns develop along one of the three following lines: they are either the result of an overstrained excitation process, or of an overstrained inhibition process, or yet, again, of an overstrained mobility of the cortical functions.

It was of great interest to apply the above principles in interpreting the typological peculiarities in man and in analysing human neuroses.

The application of physiological principles in interpreting human neuroses proved to be exceptionally fruitful. It was discovered that the pathological causes of nervous breakdown in man were the same *mutatis mutandis* as those of experimental neuroses. In the symptoms of neuroses were discovered

physiological mechanisms similar to those observed in experimental neuroses, such as the phenomena of "transliminary" inhibition, negative induction, etc. This method of interpreting neuroses proved to be particularly valuable when applied to various kinds of fixed conditions (obsessions, phobias and impulsions), characterized by the spontaneous origin under certain conditions of stereotyped pathological experiences which, in spite of the critical capacities remaining intact, were not subjected to the regulating activity of the rest of the cortex. This is precisely analogous to what occurs in experimental nervous breakdowns, when points of pathologic inertia or "stagnation" of the excitation or inhibition process are sometimes formed in the cortex, when any stimulation, conveyed to such an impaired point, always produces the same stereotyped effect, which is no longer controlled by any other parts of the cortex. Likewise it was easy to see that with respect to the different types of nervous system in man the main variations could be distinguished along the same lines of intensity, degree of equilibrium and mobility of nervous processes. However, to understand the qualitatively novel functions of the human cerebrum, Pavlov, having defined the cerebral centres of direct perception as "the first signal system of reality," introduced the notion of "the second signal system" (peculiar only to man), by which he meant all those complex cortical mechanisms, which were no longer based on the direct perception of outward impressions, but on conditioned signals; speech, images, notions, etc.

The two systems may either be well balanced, or insufficiently balanced. In the latter case, if the first signal system is prevalent, the individuals are of "an artistic type," characterized by a direct and concrete perception of the outward world.

If the second signal system is prevalent, the individuals are of "an intellectual type" and live in a kind of logical abstraction and are to a great extent detached from actual life.

The fact that in individuals of "an artistic type" neuroses mainly develop along the lines of hysteria, while individuals of "an intellectual type" mostly suffer from breakdowns of a psychasthenic nature, proved to be of great value to the clinician and has been fully confirmed by clinical observations.

A further study of the different types of nervous system in man and of the peculiarities of human neuroses has shown, however, the particular importance of the function of mobility for the human brain. Thus, as compared to dogs, man shows a far greater variety within the range of mobility and inertia of nervous processes. The lack of mobility plays an exceptional part in characterizing individuals who are particularly liable to nervous breakdown, and finally, anomalies of mobility are an outstanding symptom among those characterizing human neuroses. This exceptional role played by the mobility of the higher nervous activity, which is also revealed in its pathology, forms one of the most specific peculiarities of man.

It is easy to trace a number of pathologic manifestations of inertia both in neurotics and in many perfectly sound individuals. Variations of the normal in this case readily increase to the stage of pathologic symptoms, while observation almost invariably confirms that here we have to deal with insufficient mobility, which can be usually traced throughout the life of the given individual

down to his early childhood. Besides, it should be born in mind that by the term mobility or inertia of the nervous processes we only mean that function of the nerve centres which has been previously defined and by no means the general motor mobility, which may in no way coincide with the degree of mobility displayed by cortical functions, and may even be in a state of seeming contradiction as regards the latter. For instance, the unrestrained motor activity of puppies, which, however, are far more inert than adult dogs.

Inertia in man is not determined by Russian neurologists with the aid of any special psychologic or physiologic tests, but only by means of a detailed study of the individual's life and his behaviour in the different circumstances built up by his environment.

Inert people can be recognized by different symptoms. It is with difficulty that such people put up with any change in the conditions of their life, and not infrequently they react to a sudden change of stereotyped conditions by an onset neurosis. In these cases the mechanism of the neurosis-formation often remains undiagnosed. Moving to another town (nostalgia) or even to another flat, or changing the habitual place of work, etc., always causes such people a great deal of trouble; sometimes they even object to any changes in their mode of life, such as arranging furniture in their flat, or even changing their suit or underclothing; these kind of people cannot stand any work requiring a rapid change from one kind of activity to another. They often feel embarrassed when faced by the necessity of completing one task and taking up another, and occasionally spend some time in total inactivity, only because they lack the determination to take up any new kind of work. Sometimes they mention their utter inability to stand being rushed. They are able to form abnormally stable conditioned connections, and it is my belief that it is precisely this kind of mechanism that is the basis of many anomalies of sexual life; they are slow in going to sleep and slow in waking.

It is probable that "eudetism" mostly characterizes precisely those inert kind of people. Apart from the above examples, life presents many opportunities for testing the degree of mobility or inertia of a given individual.

I also think that the over-anxious, mistrustful disposition which is a favourable background for the development of massive symptoms of pathologic inertia (obsessive conditions), and which manifests itself in constant indecision and doubt, should essentially be attributed to the same insufficient mobility of cortical processes.

Indeed the correct choice of the proper form of behaviour always presupposes a rapid inhibition of all other forms of behaviour which might be possible in the given situation. The process can best be illustrated by analysing the behaviour of some animals, for instance that of some predatory beast on catching sight of its prey. Under the circumstances there are a number of different actions which may be performed by the animal. It may, for instance, spring at its prey at once, or it may remain stock-still on the spot waiting for the prey to approach it so as to shorten distance for the final jump, or again it may creep noiselessly towards its prey, etc. There is, however, one condition which is equally indispensable for all different solutions of the problem, i.e. that the animal should at once choose only one of the possible solutions, while

all the other solutions, which have arisen in association with the given situation, should be checked, or to put it in physiological language, it is necessary that a negative induction should be formed as soon as possible from the cortical mechanism which has been set in operation.

An animal that lacks sufficiently rapid negative induction and that would simultaneously have several possible solutions, disputing for some time which was to act the leading role, would soon be swept away by natural selection.

It is precisely the simultaneous existence in a man's consciousness of several possible solutions of a given situation, or, in other words, the same insufficient mobility, which characterizes the psychology of indecision and constant doubt, which makes a person feel uncertain of himself and gives rise to a feeling of inferiority and to a desire of constantly "making sure of oneself," that is so typical of an over-anxious and mistrustful disposition. It is precisely against this background that conditions of a stable pathologic inertia involving either the excitation or the inhibition processes and manifesting themselves as various obsessions, phobias or impulsions are found to develop most readily.

To analyse the origin of all these intensity, equilibrium and mobility variations of the cortical functions in different individuals often proves to be a very complicated task. There is no doubt that upbringing, training and various pathological influences play a part in the formation of these properties. The role of these factors can be traced with particular clarity in the formation of the inhibition process. It is beyond doubt that the development of these functions is to a great extent determined by congenital and hereditary factors.

It appeared that since the above described essential physiological properties of cortical activity could be successfully determined—and, at any rate experimentally, this could be done with great exactitude—the problem of establishing their intimate genetic structure would not present any great difficulty. It even seemed, at first, that by interbreeding dogs specially selected for the purpose, it would be easy to establish the presence of special weakness, disequilibrium and inertia genes and their corresponding alleles of intensity, equilibrium and mobility. However, besides our being—as we have since found—practically ignorant as to the normal alleles of mutant genes, this method of tackling the problem was faced by an unexpected difficulty which, being a matter of principle, might be briefly formulated as follows:

All these characteristics can be classified according to two large groups, one of which involves such characteristics as are more or less readily subjected to genetic analysis, the other comprising characteristics whose genetic analysis always presents the greatest difficulty. An attempt to find out in what way the two groups of characteristics differ from one another clearly shows that those belonging to the first group, i.e. characteristics which are readily subjected to the usual genetic analysis, consist, in the first place, of pathologic characteristics which are manifestly harmful and undergo the process of continuous elimination by means of selection (such as all our "hereditary diseases"), and, in the second place, of characteristics which are entirely neutral with respect to the fate of their bearers (such as blood groups, taste groups, dactyloscopic types). The point in common in both these types of characteristics is, that neither the former nor the latter participated in the evolution of species.

Contrary to this, these characteristics which constitute the second group (i.e. those that present considerable difficulty for the usual genetic analysis) are precisely such characteristics as *have* participated in the evolution of species. In the process of evolution each newly formed mutation has such a large number of modifiers and such extensive correlative connections that the gene structure of the characteristics formed often remains entirely concealed, in spite of their evidently being hereditary. For instance: We can easily study the gene which causes insufficient development of both the upper extremities in man, though the methods which are at present available would scarcely enable us to discover the "gene of normal two-handedness," in spite of the fact that man's possession of two hands with four fingers and a thumb on each is a heredity-conditioned property. I am apt to believe that the same idea has been expressed by J. B. S. Haldane in his *Causes of Evolution* when he wrote that geneticists are far better able to say why a white cat differs from a black one than to explain why they resemble each other.

If we consider from this point of view the problem of the different types of nervous system—which are complex variations of the norm—we shall have to admit in advance that, contrary to the hereditary diseases of the nervous system, the types of the nervous system should be regarded as belonging to the second group of characteristics, and that for this reason their gene structure must be exceedingly complex. The fact that to some extent these types are hereditary is testified by our everyday clinical experience. It is even possible to trace in the hereditary transmission of some of these properties as, for instance, inertia or a tendency to hysteria, certain dominant components (not unfrequently an analogous encumbrance along one of the parent lines). Yet we have so far either entirely failed to reveal in detail the hereditary structure of these types by means of studying our genealogies, or have succeeded in doing so in a very general way, perhaps with the exception of single, clearly aberrant forms.

For this reason the consideration of the types of the nervous system from the point of view of their evolution becomes of particular importance.

It is obvious, of course, that the substitution of individualized behaviour for instinctive behaviour having been connected with the development of a complex system of conditioned reflexes was one of the most striking progressive changes—or "aromorphoses" according to A. N. Severtsov's terminology—which, together with the formation of the thermo-regulation apparatus, enabled the Mammalia to oust the Reptilia in the course of the Tertiary period. Ever since, the evolution of the Mammalia has proceeded along the lines of an invariable improvement of the higher nervous activity. The main peculiarities in the work of the cortical cells—their intensity, equilibrium and mobility—were the object of natural selection for a very considerable period of time.

From this point of view many investigations on the comparative physiology of conditioned reflexes conducted by Russian physiologists (J. P. Frolov and others) have come to be of exceptional value. Besides their having yielded a number of novel facts of considerable interest, these studies have disclosed a certain lack of similarity in the essential cortical processes, viz. nerve cells of highly developed mobility proved to be characteristic of the most progressive

forms. Rats, guinea-pigs, dogs and monkeys differ from each other precisely with respect to the mobility of their nervous processes, which depends on the level of development reached by the animal's nervous system. The ability to form rapidly new conditioned connections proved to be an indispensable property as soon as individualized behaviour based on the specimen's own experience took the place of fixed instincts in becoming the object of natural selection. The exceptional value of this ability to form swiftly new conditioned connections can be illustrated by the appearance on the earth of a new enemy, i.e. man. His appearance proved to be a kind of "examination in mobility." Species capable of swiftly forming new conditioned connections survived, while those lacking in this ability were soon extinct, as, for instance, the *Rhytina borealis Stelleri*. The latter were discovered by Russian seafarers in the eighteenth century on the practically unapproachable islands off the north-eastern coasts of Asia, and became entirely extinct within $2\frac{1}{2}$ decades. These animals let themselves be killed without making the slightest attempts to escape, while seals inhabiting the same islands were found to dive into the sea on sighting a man at a distance of 200 metres as early as in a year's time after they had been first hunted.

Within the period of anthropogenesis, evolution was characterized by a further development of the higher nervous activity, which enabled man to gain a dominating position over the rest of the animal world. Here we are faced with a somewhat mysterious phenomenon which might be called a peculiar *paradox of neuro-psychic evolution*.

Indeed, it might have been reasonably assumed that the higher nervous activity of man, being the result of natural selection, which invariably served to improve the work of the cerebrum, ought to have been characterized by maximum co-ordination, regularity and precision. Yet it is in no other than man that we observe so great a number of typological deviations of an unfavourable nature and a tendency to develop dynamic cortical breakdowns. The question arises how could natural selection, which in the course of hundreds of thousands of years had served to select all the best and most favourable variations, eventually result in creating so fragile an apparatus with so great a tendency to nervous breakdowns of the most varied nature?

Investigators have long since been interested in the problem, and, as early as in 1875, Galton pointed to the fact that the evolution of man had not yet created an entirely adequate psychic form. I further venture to make a few suggestions on the probable solution of the problem which are based on Pavlov's physiological interpretation of the psychic life of man. Considered from this point of view, the history of man's appearance must have occurred as follows:

Since the time our most distant human ancestor, the pithecanthropus, made his appearance on the earth (800,000–1,000,000 years ago), natural selection started working in the direction of a further powerful development of the higher nervous activity. However, the different physiological properties of the cerebrum could not always make equal progress in the process. The pithecanthropus, which still led an entirely wild existence, could not have survived if he had not been endowed with nervous processes of sufficiently high intensity and equilibrium, for these qualities are absolutely indispensable

to a primitive huntsman. There is no reason to suppose that the further pre-history of mankind contributed towards any considerable intensification of precisely these properties of the nervous system. On the contrary, it is more probable that life in a collectively protected community would make lesser claims to the inhibition process than life under conditions of utter savagery. On the other hand, the powerful development of the second signal system and of the mobility of nervous processes was the most necessary condition for any further progress; the appearance of speech, which apparently coincided with the transformation of the Neanderthal man into modern man (30-100,000 years ago) meant that the two latter functions had been enormously intensified. In considering the pre-history of mankind from the view-point of the history of cortical functions, one is led to admit that the appearance of the modern, super-rapid mobility of the cortical processes, and the development of the second signal system that is in perfect equilibrium with the first, are phylogenetically the most recent acquisitions of man. This fact in itself would have been important for a better understanding of the great variability displayed precisely by these functions, as the high changeability of phylogenetically young characteristics is generally known. However, I don't believe that this alone might serve as a satisfactory explanation.

The other factors which have been usually underestimated were apparently the consequences that must have inevitably occurred as a result of natural selection having been gradually limited. Man himself, the creation of natural selection, eventually served to destroy this natural selection. It might be of interest to note that natural selection probably underwent a process of gradual elimination which covered a long period of time. The first blow that fell on natural selection was struck with the stone weapon of the pithecanthropus, while Darwin's species-forming selection ceased finally with the transformation of the Neanderthal man into *Homo sapiens*, whose physical structure has not changed since the Upper Paleolithic. Moreover, it is very important that selection was not being uniformly eliminated with respect to the different functions of the human organism. Thus, selection as regards resistance to temperature fluctuations or as regards the capacity for masticating and digesting raw food must have become extinct as soon as man gained the knowledge of fire and dwelling, i.e. it must have ceased much earlier than selection of the mentally gifted specimens. However it might have been, it all ended in man's final victory over nature. No sooner had he gained this victory than he began paying for it.

Indeed, if the survival of the most fit is the essence of natural selection, then the elimination of natural selection must have in the first place resulted in the expansion of the least fit, which had been impossible before that time. Of course, this expansion must have occurred at the expense of the most recently developed functions which have the largest number of variations. Individuals of an inert disposition or people having a lagging second signal system must have necessarily come to make up a greater part of the earth's population. At present there is reason to suppose that the process must have been still further intensified by the fact that the vast majority of the most progressive properties of the nervous system which had formed at the time

when Neanderthal man was transformed into modern man were essentially based on the formation and accumulation of small mutations of a recessive nature. This is indirectly confirmed by the fact that typologic anomalies, particularly those of mobility, are revealed in the genealogies of our neurotic patients for the most part as a certain dominant element.

Are there, however, sufficient grounds for believing that at its dawn the prehistory of mankind abounded in so great a number of neurotic phenomena that it is possible to speak of some sort of "neurotic phase" in the early history of mankind? To my mind, the history of primitive religion may provide a satisfactory answer to this question.

Already specimens of Magdalenian pictorial art contain some strange images of half-men and half-animals which apparently express some vague beliefs of primitive man. It is possible that the imprints of hands with cut-off phalanges found on the walls of Aurignacian and Solutrean caves had a similar meaning. It is beyond doubt that primitive religion first originated at a very early date. Of course we have no knowledge of its details, but if we assume that there is any analogy between the psychology of a modern savage and that of our paleolithic ancestor, we shall have to admit that ethnography provides us with exceptionally abundant material for the problem in question.

What could have given rise to animism, this universal and most surprising error of judgment and this also universal form of primitive religion? Such is the question that has been much discussed in ethnography. In my opinion the solution of the question might be considerably promoted by interpreting these phenomena in the light of such regularities as have been found to operate in the physiology and pathology of the higher nervous system. It should be noted that any attempts at attributing this erroneous judgment of the savage to some qualitative peculiarities of primeval logic, such as Levy-Bruhl's "*pre-logicism*," or the "affective-," "collective-" or "complex-thinking" of other authors, proved to be a failure. On the other hand, such ethnographic data as speak in favour of the theory that man began practising certain magic acts directed against nature before the time his belief in its being animated had first arisen are growing more and more numerous (Frazer and others). According to this view-point man's religion did not begin with ideas; it began with a ritual, with a definite set of performances and actions. Later, however, he passed on to the general animation of nature with all the ensuing consequences (therotemism and totemism). Now, how could this have happened? Ethnographers suggest the following answer: magic produced animism because man became convinced of the inefficiency of magic and began seeking other explanations. A neurologist, however, believes another explanation to be more to the point: magic was by no means inefficient; on the contrary, it was most useful to primitive man. Having repeatedly convinced himself of the efficiency of magic performances and arguing with the help of the most natural human logic, man must have necessarily found some explanation of his direct influence over nature. The only possible explanation, of course, lay in the belief that nature was animated, inasmuch as primitive man had no knowledge of Pavlov's physiology of the higher nervous activity in general, or of negative induction in particular.

To understand the expediency of primeval magic actions it is necessary to interpret them in the light of the physiology of cortical processes, and especially in the light of their physio-pathology. A conditioned action has in the first place a sedative effect and removes the sense of fear on the ground of exactly the same physiologic regularities, on whose ground the ritual action of a neurotic eliminates his phobia, i.e. by forming in the cerebral cortex a new affectively-tinged excitation focus, which produces a negative induction in all the other parts of the cortex. Hence the feeling of calmness which results in a more successful solution of some difficult life problem. Indeed, what interpretation can we give in the light of the dynamics of cortical processes to the actions of an Australian native who is hurrying home and breaks the branch of a tree to stop the progress of the sun? He is in a state of anxiety and alarm, owing to the stagnant and affectively-tinged excitation involving certain cortical complexes; this anxiety makes him suffer, troubles him, and begins to acquire all the features of an obsession. Then the man builds up in his cerebral cortex a new point in which the excitation process is concentrated (it is quite indifferent what kind of point this is, as long as it is causally connected with the main point of over-excitation), and uses the negative induction proceeding from this second focus as a means of producing a sedative effect on the rest of the cerebral cortex. The sense of alarm is lost and the man becomes better able to control his actions, with the result that he has a greater chance of reaching home before the sun has set. The ritual action has had the necessary effect, and when next time the Australian native again resorts to the same method, whose efficiency has already been proved, he can duly be regarded as a man whose actions are based on experience and observation.

Thus fear was the essential background against which all this mechanism was found to develop. It is also fear which, like a psychic pandemic, can be traced throughout the life of a present-day savage, who aggravates his existence by endless absurd ritual practices and taboos. However, it is not so much the element of reasonable apprehension as that of an obsessive phobia that we can find in this latter kind of fear. Yet, of course, initially it was derived from apprehensions caused by real danger. According to clinical observations, phobias as well for the most part develop against a background of entirely real apprehensions. It is beyond doubt that Freud was quite right in drawing an analogy between phobias and taboos. In order to gain a true understanding of the matter, however, Freud's argument has to be entirely reconstructed; it is not the neurotic who is endowed with some kind of peculiar primitive psychology and archaic constitution, but it was the primeval culture which bore a marked impress of neurosis. One of the causes which brought about this neurotic impress lay in the excessive spreading among the earth's population of inert personalities, particularly liable to indecision, doubt, and the development of obsessive conditions—the excessive expansion of such individuals having been made possible by the elimination of natural selection. Their psychology became dominant during that first stage in the pre-history of mankind, and resulted in the organization of ritual practices into definite systems, and in the development of numerous cults into which the better balanced nervous types were likewise drawn in.

However, the elimination of natural selection must have resulted not only in the spreading of inert individuals alone, but also in the expansion of individuals having a lagging second signal system, who are known to have a tendency to reactions of an hysterical type. Indeed, they also left their marked impress over a lasting historical period, having become specialists in keeping in touch with the spirits of whose existence mankind had already become convinced. There is no doubt that shamanism in all its different manifestations has made use of mechanisms of a clearly hysterical nature.

History knows no other example of hysteria being organized on so large a scale into almost a state system, beside which the medieval epidemics of diabolism and the hysterical women of the Salpêtrière seem to be practically of no importance.

It goes without saying that these psycho-physiological mechanisms were not the factors which served to determine mankind's progress, whose main-springs were the production activities and the toil of primitive man (hunting, the manufacturing of tools, then later land tilling, etc.). Tribal formations came into being. History continued to run its own course. The primary neurotic stage of human pre-history could only remain fixed in small backward tribes which had come to an impasse with respect to their cultural and historical development owing to certain complex historical and geographical conditions (such as isolation, exceedingly hard conditions of life, subjugation by more powerful neighbours, etc.). Under more favourable conditions this initial neurotic phase had necessarily to be compensated in some way or other. However, this time the compensation no longer proceeded along the lines of natural selection, i.e. along the lines of an improved genotype, but along the lines of an improved phenotype, viz. along the lines of education, upbringing, training and the development of more reasonable forms of behaviour. Since then the display of neurotic reactions has ever been made more and more difficult. Neuroses have ceased to be cultivated and have been "driven underground," while upbringing has come to be the factor by which a man's behaviour is being determined to an ever-increasing extent. This progress—which no longer proceeded along the lines of heredity, but along those of succession—has not ceased up to the present day, while the genotype of modern man still remains very imperfect.

This, apparently, is what accounts for the "paradox of the neuro-psychic evolution" which has been previously discussed.

There is one objection which might be made against our arguments that I should like to reject in advance, namely, the great abundance of unfavourable typological variations among dogs and their susceptibility to all kinds of nervous breakdowns might seem incomprehensible at first sight, and might lead to the conclusion that a similar fragility of the higher nervous activity may also occur at lower evolutionary phases. However, leaving aside the fact that the dog can by no means be regarded as a possible ancestor of the primates, this comparison is actually an indirect confirmation of the correctness of our views, as the above mentioned properties of a domestic dog are also an evident result of eliminated natural selection, with the only difference that in the case of the dog natural selection was to a great extent replaced by artificial selection

on the part of man, while in the case of man natural selection was destroyed by man himself. Moreover, there are good reasons to suppose that in creating a domestic dog man must have made use of some aberrant forms of behaviour displayed by individual animals, and thus must have dealt from the start with somewhat pathologic material for the purpose of further selection. Thus, the hereditary faculty of entering the state of catalepsy at the sight of some prey, which has been used by man to develop the kind of dog that will stand stock-still for a considerable length of time pointing to the game it has discovered, could hardly have been retained in a wild animal under the conditions of natural selection.*

* The argumentation which has been laid forth in brief in the present paper is discussed *in extenso* in the Russian manual bearing the title *Evolutional and Genetical Principles in Neuro-pathology*, which is now ready for print.

MORAL DEFICIENCY.*

By L. S. PENROSE, M.A., M.D.

THE harmonizing of legal administrative practice with the development of scientific concepts in the field of medicine is sometimes difficult. The law has to be understood by everybody, whereas scientific knowledge is too often considered the privilege of the educated few. Thus, the law must be simple and directly applicable, leaving for the expert, critical examination of causes and effects. When the definition of a situation depends upon physical findings, a decision can be made without very much difficulty as to how the law is to be interpreted; but in questions of behaviour interpretation of rules may be much more troublesome, and special care is required in drafting laws which define psychological concepts.

It is not altogether surprising that the definition of mental deficiency in the 1913 Act should have little relationship to scientific concepts. The surprising fact is, as it seems to me, that the law, which normally has no intention of intruding upon the scientist's domain, has attempted to do so in this case. It is most important *not* to assume that the class of legally certified persons can be treated in any way as a scientific entity. Presumably the Law should provide a convenient instrument for certifying or otherwise handling individuals whom most people are agreed would be best under the care of institutions, guardians, etc. This state of affairs was underlined by the attitude of the authors of the Wood report in 1929, who went to some lengths to explain that the real criterion of mental deficiency was a social one, i.e., not a judgment based on clinical medicine or psychology. Social incompetence is not a scientific concept; it is a relative quality estimated differently by different people in different places according to circumstances. It must, therefore, be considered anomalous that the law relating to mental deficiency takes great pains to give the outward signs of following scientific classifications by specifying Idiots, Imbeciles, Feeble-minded and Morally defective. The foremost authority on mental defect Tredgold, in the first edition of his text-book (1907), referred to two other types of defect. One of these, Religious deficiency, was the incapacity to feel reverence towards "a Supreme Being, who has superhuman control over the destiny of man or the powers of nature." The other type, Aesthetic deficiency, was lack of appreciation for "all that is beautiful in form, colour, sound, etc." Perhaps it was fortunate that no further complications were added to the Acts, but there are some who might have argued that the religiously or the aesthetically defective were more dangerous to the community than the intellectually defective.

According to modern standards, if a mental deficiency Act had any real intention of being scientific, it would distinguish those types of defect, which

* Read at a meeting of the Mental Deficiency Section of the Royal Medico-Psychological Association, 28 November, 1946.

can now be clearly defined. We should have a long list. American recommendations for statistical classification recognize defect associated with cranial anomalies, congenital paralysis, mongolism, post-traumatic and post-infective types, those with endocrine disorder, familial types and mental defect without signs of clinical disease ; but the Americans are wise enough not to include any of these ideas in statutes which determine certification. As scientific inquiry advances, methods of diagnosis and treatment change. The Law, which is intended to be as permanent as possible, should beware of accepting the definitions of types which are in vogue at the moment. In 30 years' time, details of statutory descriptions of all types of defectives made now, backed by the best clinical opinions, would appear as foolish then as the definitions of the 1913 Act seem to us now. Consider, for example, the definitions of idiocy and imbecility. These take no heed of test results, which are the main basis of grading in practical work. The way in which imbeciles are singled out as those who are "incapable of managing themselves or their affairs" strikes rather a ludicrous note. Moreover, when three categories of intellectual defect were specified, why were three categories of moral defect not also specified? "Moral idiot" and "morally feeble minded" would have been picturesque designations to extend logically the category of moral imbecile. Had legislators accepted the ideas of religious and aesthetic defect, symmetry would have demanded that atheists should be catered for by the diagnosis of religious idiocy, and I think quite a large proportion of the population might have qualified for the diagnosis of aesthetic imbecility. I draw attention to such trivialities because they emphasize the absurdity of attempting to categorize psychological types by Act of Parliament. Not only are the present legal categories unsatisfactory for descriptive purposes, they are also totally unnecessary. The Acts could specify what constitutes mental defect and leave it there. Indeed, the M. D. Act of 1927 does define "mental defectiveness" as "a condition of arrested or incomplete development of mind existing before the age of 18 years, whether arising from inherent causes or induced by disease or injury." If we add, "in a person who requires care, supervision and control for his own protection or welfare or for the protection of others," what more is required? If, moreover, following the advice of the Wood Report, the definition of arrested development of mind should be based upon criteria of social capability, this could be explicitly stated. On the other hand, if, as some people think, the definition of mental defect should be based upon intellectual capacity, the maximal performance required on tests could be specified. Simplest, however, is to leave the matter open and to assume that the certifying physicians know their job, can recognize mental defect and need for care when they find them, and can give their reasons adequately at the same time. Such common-sense procedures do not seem to lead to misunderstanding or abuse in the United States or in Canada. Lack of detailed specification leaves more freedom for the development of clinical or statistical research than too rigid criteria. Furthermore, it is hard enough on the parents to have their child labelled mentally defective without calling it legally an idiot as well.

Turning now to focus on the concept of "Moral Deficiency" (the 1927 Act euphemistically drops the term "Imbecility"), it is of some interest to inquire

whence this concept originated. In his 6th edition Dr. Tredgold admits that the inclusion of this concept in the Acts has led to much diagnostic and administrative difficulty, yet he believes that there is a real, though small, group of cases to whom it rightly applies. Dr. C. Mercier, who drafted the original definition of Moral Imbecility, evidently intended it to apply to a type of defective not ordinarily regarded as being defective. The crux of the matter, then, for the present purpose is to ascertain, first, whether or not such a class of persons exists and, secondly, to consider whether or not, if they exist, they should be regarded as mentally defective. It is obvious that, if such cases were recognizably defective in the ordinary sense implying intellectual impairment, no separate legal category would be needed under which to deal with them. To understand how this group of cases has come into prominence we must delve into the past.

In the latter half of last century, the investigation of criminals, from both morphological and psychological points of view, became very fashionable. The study had the dignified name of Criminal Anthropology, and it is still sometimes pursued even at the present time, though with much less enthusiasm than formerly. The "science" grew up on the basis of work of anatomists like Broca (1859), and of students of heredity like Prosper Lucas (1847) and Morel (1864). Thus Maudsley in 1872, speaking of "instinctive criminals," remarked that it was a matter of common observation that this criminal class constituted "a degenerate or morbid variety of mankind, marked by peculiar physical and mental characteristics." These physical characteristics were easy to observe. "I do not need to see the whole of a criminal's face to recognize him as such" said Vidocq; "it is enough for me to catch his eye." Such views were supported by the observations of Dr. G. Wilson, who read a paper at the British Association in 1869 entitled, "The Moral Imbecility of Habitual Criminals as Exemplified by Cranial Measurements." Bruce Thomson made observations on 5,000 prisoners at Perth and this survey, together with the researches of Despine (1868), laid the foundations for the study of criminals throughout Europe, which reached its apex in the work of Lombroso of Turin (*L'Uomo Delinquente*, 1889). The result of all these inquiries, conducted often with prodigious energy and summarized by Havelock Ellis (1890), added up to this, namely, that a great many physically and mentally abnormal human beings found their way into prisons. However, these investigations entirely failed to prove that there was anything which could be recognized as a "criminal type." To take one example, Galton suggested that, if the physiognomies of criminals showed a common factor characteristic of criminality, then a composite photograph should extract this quality. The exact reverse proved to be true. Composite photographs of faces of criminals, particularly those who were defective or insane, gave rise to portraits, rather pleasing and noble both in feature and expression, which would pass well for rather blurred photographs of clergymen. The factor common to all kinds of criminals is that they are basically human. There is, in fact, no "criminal type" as emphasized by the results of Charles Goring's very complete survey made in Parkhurst Prison (1913). It follows, as a corollary, that there is no "morally defective type".

Rather paradoxically, the popular attention devoted to criminal anthro-

pology tended to relieve the lot of the criminal, for, if crime is due to inborn defect, punishment is obviously useless. Given that a criminal type exists and that some people are born with uncontrollable innate vicious tendencies, there are only two possible courses of action. "The evil doer," wrote Diderot in 1782, "is one we must destroy, not punish"; that is an early example of advocacy of what now is politely called "euthanasia." In England the liberal background to legislation rejects altogether such a harsh alternative, and thus the second possibility of certification under the heading of moral deficiency has been welcomed. I think it is correct to say that among medical psychologists at the present time, the teachings of Lombroso and of his school of criminal anthropologists have been discredited. We no longer look for or dream of finding a criminal type. On the contrary, we have taken over the study of criminal behaviour as a branch of psychiatry in its broadest sense. We speak of the scientific treatment of delinquency. We do not need a concept like moral imbecility any longer unless we wish to return to the ignorance which prevailed a century ago.

As a good general approximation for practical purposes, it seems satisfactory to differentiate between mental defect and mental disorder. The total intellectual capacity of the individual (which may not, of course, be scholastic in character) is a quantity like physical strength, which can be measured reasonably well by existing tests. Disease or developmental defect may impair the intellectual capacity but that which remains can be measured. This property of the mind is distinct from disorder, which implies active illness of an acute or a chronic type. Under disorder are included psychosis, neurosis, psychopathic personality, sexual perversion and epilepsy. Any and all of these can be combined and superimposed on any degree of mental capacity. Some of the oldest workers in the field of mental defect believed that defectives were exceptionally innocent and free from mental or moral disorder. Later workers tended to go to the other extreme, and to teach that defectives were specially prone to psychopathy. In my view, the two qualities psychopathy and defect are distinct and not closely correlated—except possibly in the case of epilepsy. In practice, it is often extremely difficult to distinguish the combined effects of disorder and defect and to assign credible causal factors, e.g., to distinguish early schizophrenia from defect. However, we do now know what causes to look for. Inherited characters are physical and chemical differences between individuals, not deficiencies in moral or religious appreciation. Nature can lay the groundwork on which the development of a delinquent character may be favoured, but the delinquency itself cannot be inborn. Adverse environment or unfavourable nurture acts by way of infectious disease, injury or malnutrition in the physical realm and by way of abnormal conditioning in the psychological realm. The positive effects of the mental vitamins of parental love or its equivalent in foster parents are beginning to be appreciated. All these advances in thought have completely superseded the concept of moral defect, which, I repeat, should be abandoned completely in the interests of scientific research and progressive administration.

In conclusion, I would like to mention one practical question, which seems to me of importance in connection with this discussion. The cases for whom

the category of moral defect was planned and for whom it is presumably still used (though the Board of Control's Reports are not informative on this point) fall in a region which lies between those usually covered by experience in the fields of psychosis and mental deficiency. These are the cases of repeated anti-social behaviour in young persons too intelligent to be easily classed as defective and not enough mentally disordered to be easily classed as insane. They are neither fish, flesh nor fowl and no one wants them. The specialist in psychosis is very glad to get rid of them and to have them handed over to the mental deficiency expert. This he can do legally, under the category of moral defect, and the mental deficiency expert, on receiving them, naturally must assume them to be defective in one way or another. If the Binet score is normal, then perhaps some other test can be found on which they will fail and, if so, his conscience will be eased. I am, however, convinced that this is a matter for co-operation between administrative psychiatrists and experts in defect.

Since only about one feeble-minded child out of 50 actually gets certified, the institutional group of high-grade cases consists largely of patients selected on account of social lapses or, perhaps, anti-social tendencies. Sometimes it is the parent and not the patient who is socially undesirable. Moreover, the psychopath with rather low intelligence, who is prone to anti-social conduct, is much more liable to be caught than the clever one. This selection of psychopathic defectives for institutionalization tends to give rise to the erroneous idea that defectives, as a whole, are prone to crime. Surely, institutions for defectives are loaded heavily enough with such psychopathic cases as these without being burdened with psychopaths, who are not even intellectually defective! Administrative psychiatrists would not all be enthusiastic about accepting a burden of extra patients, but perhaps they might be induced to give up a few good working non-psychopathic defectives in exchange. I wonder! Wherever they should go—to approved schools or special colonies—delinquents who are not intellectually defective, should emphatically not be sent to institutions for defectives, where other patients are sent for their own protection.

A SURVEY OF SUBNORMAL TYPES.*

By D. CARADOC JONES, M.A.

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WHEN I was invited to take part in this Conference it was suggested that I should speak on some aspects of the population problem in relation to poverty, social inefficiency and mental disorder, as illustrated by the Merseyside Survey. At first I confess I felt very hesitant about it, for I did not want to go over ground that might already be familiar to you. But then I reflected that the purpose of the Conference was, no doubt, to recall and discuss work done in the past having some bearing on the *quality* of the population—an aspect of the problem that is only beginning to receive the attention it deserves. Before replying I therefore consulted Dr. Blacker as to whether it might meet your purpose if I attempted to summarize quite simply a few of the conclusions reached in the course of the Merseyside Survey concerning certain subnormal types in the community. It was only after I had been fortified by his reassurance and that of Dr. Cook that I ventured to accept your kind invitation, and I make my apologies here and now to any of you who find it tedious to listen to a reproduction of what you may have read in the published account of the Survey.

I had better begin by outlining the scope of our work. We attempted a fairly detailed description of the social and industrial structure of Merseyside as it was round about 1930. The region surveyed took in four County Boroughs—Liverpool and Bootle on one side of the Mersey, Birkenhead and Wallasey on the other, besides certain adjacent urban districts. The picture we drew included most of the normal features of social life, such as an analysis of the population by sex, age and marital state, their housing conditions, and way of life at work and at leisure, their earnings and how they were spent, education, organized religion, and the contribution of the social services to health and welfare.

In addition, we broke some new ground by a survey of certain subnormal elements in the population. The particular aspects of the selected subnormal types which we studied were, of course, not medical in character, but sociological, and the two aspects on which I shall concentrate in this paper are social class and size of family. I choose these because the analysis appears to show that subnormality, no matter what type one selects, is associated predominantly—sometimes more, sometimes less—with the lowest occupational grade, and it is found in families which are significantly larger than the average. If that be so, we have a combination of factors making for increasing social inefficiency, unless there are other counterbalancing factors, such as a higher mortality rate in these same families, operating to maintain stability.

We took extreme care in the delineation of our subnormal types, consulting medical specialists at the beginning of the inquiry in framing such definitions

* A paper read at the Winter Meeting of the Royal Medico-Psychological Association at 11, Chandos Street, W. 1, on 21 February, 1947.

as came within their province, and also receiving their kind help when any doubt arose as to border-line cases. Fundamental to our method of analysis was the use of a control group, a standard against which we could set any subnormal group for comparison. This control group was a random sample of the normal working-class population. The criterion by which the working class was distinguished was the occupation and, for non-wage earners, the probable net income. The random sample was obtained by selecting from the Voters' Register 1 in 30 of all houses or buildings in which private families slept in every street throughout Merseyside, omitting only such buildings as hotels and institutions. All these dwellings, if inhabited by working-class families, were included in the survey, and certain information was sought about each of them by our investigators, who received very detailed written instructions, which were also carefully discussed with them, to make sure that everyone knew what procedure to follow in order to get the information wanted. These investigators were, by calling, school attendance officers, and each was assigned an area with which he had grown familiar in the course of his routine day-to-day duties; they already knew a good deal about every family containing children of school age in their own areas, so that it did not prove very difficult to get the additional information desired. This included, among other matters, the composition of the family by sex and age, number of children living and dead, occupations of those at work, earnings and other sources of income, and housing accommodation. I might mention here that the occupations were subsequently subdivided according to grade, non-manual and manual, the manual being classed as skilled, semi-skilled, and unskilled. The total number of families in the random sample investigated was 6,906, comprising a population of 28,845. In Liverpool alone the number of families sampled was 4,834, with a population of 20,080. Information was, in fact, obtained from 93 per cent. of the families approached.

I had intended to illustrate the use made of this household sample by a control group, by comparing the families in general of which it was composed with families which were subnormal in regard to income and housing conditions, that is to say, all families in the same household sample which fell below carefully defined standards of poverty and overcrowding. But time will not permit of this, so I pass on at once to that part of our survey which related to such subnormal types as the deaf, the blind and the mentally deficient. Here our investigation was very much in the nature of a first effort, made necessarily along a fairly broad front. But, tentative and experimental though our work was, some of the conclusions reached can, I think, be accepted as reliable. I mean that any defect in definition, classification, or method of analysis would scarcely be serious enough to reverse the conclusions reached.

DEAF.

Sources.

(a) Liverpool Education Authority: particulars of children up to 16 from all parts of Merseyside attending a special school for deaf.

(b) Liverpool Deaf and Dumb Institute: access to register of all known adult deaf on Merseyside.

Definition (after consultation with medical experts) :

Congenital included all recorded as *born* deaf, or where deafness stated to be *probably congenital*, or where *onset* was presumably *under one year of age* and without adequate cause (e.g. measles, meningitis, tonsillitis were judged adequate, but *not* a fall or a shock).

Acquired included all cases where *onset* was recorded as *gradual*, or at a *definite age*, or associated with an alleged external cause (an adequate cause, if the child was under one), or if there seemed to be no adequate cause but some doubt as to whether *onset* was under one year of age.

Altogether 922 cases were observed, a slight excess of congenital over acquired and of males over females, the sex difference being probably significant. Of 348 cases of acquired deafness, where age of onset was given, 85 per cent. became deaf under 10 years of age.

Occupational grade and employability.—The families in which deaf children appeared were rather below the average of the general working-class population ; 43 per cent. of the fathers of deaf children were of the unskilled labouring class, as compared with 39 per cent. of the heads of normal working-class households. On the other hand, a high proportion of occupied deaf men were found to be engaged in skilled work. In qualification of this last conclusion it must be added that a high proportion of deaf men failed to get work of any kind, 38 per cent. as against 18 per cent. of male adults in the general working-class population. Moreover, the deaf retire early from the scramble for work. In a random sample of 4,662 adult occupied males in the general working-class population of Liverpool, 25 per cent. were of age 50 or over, whereas of 292 adult occupied deaf males, only 18 per cent. were 50 or over.

Marriage and size of family.—Deaf people marry less than the normal population, but in about 4 out of every 5 such marriages recorded on Merseyside, both partners to the marriage were deaf. This was due to the fact that the deaf are usually very sensitive, and they understand one another much better than they are understood by people who hear. Consequently there is a natural bond of sympathy between them and, when they meet, they are drawn to one another. Frequent occasions for meeting were provided in Liverpool, first in the special schools and afterwards in the Deaf and Dumb Institute.

Is the marriage of a deaf person to be deplored ? What about the offspring ? As a result of 192 deaf marriages, i.e. marriages in which at least one partner was deaf, only 10 children were recorded as born deaf, <3 per cent. of all known living children. Also, the mean number of living children per deaf marriage was 1.90 as compared with 2.97 in the normal working-class household.

It would thus appear that the number of children born to deaf parents is not great and the risk of them being born deaf is very slight. If only one partner to the marriage is deaf, and the deafness is acquired not very early in life, the child of such a marriage may suffer no special hardship, especially if the father is in regular work. We ought clearly to judge the question in view of the probable effect on the children and their future social efficiency. Two deaf persons without children might add to one another's happiness in life by marrying and so sharing their common burden. But if even one partner to

the marriage is congenitally deaf, and therefore in all likelihood also dumb, any child born to such a parent is bound to be handicapped in its early years. Though children born to deaf parents are not as a rule themselves deaf, parenthood of the congenitally deaf is not without danger. Even if no disability is evident in the immediate offspring, it may come to light after skipping a generation, as some of our pedigrees showed.

We have discussed size of family resulting from deaf marriages. We have now to consider marriages in which both parents appear to be normal, but at best one child is deaf. The mean number of living children in 219 such families, each containing a deaf child between the ages of 5 and 21, was 4.27 per family. This is appreciably above the average in size, for the mean number of living children per family in a large random sample of working-class families, each containing at least one living child, was found to be 3.39. There was no significant difference in size of family according to type of deafness in the deaf child.

BLIND.

Sources.

Since 1920 the law requires that a Register be kept of the Blind in the area of each Local Authority. This task and the promotion of their welfare was delegated in Liverpool to the Liverpool Workshops and Home Teaching Society for the Blind. Also, for children of 5 to 16, too blind to profit by ordinary school teaching, the Local Education Authority provided two Special Schools, and advantage was taken of permission to provide education beyond the age of 16 for blind persons to learn a trade.

Number and definition of cases.

From these two sources information was obtained concerning 1,195 blind persons on Merseyside, 623 males and 572 females. The blindness was classed as congenital in 367 cases and acquired in 828, where the *congenital* included those born blind or partially blind; those afflicted at birth with a disease or defect which causes blindness, though the blindness may not always become evident until later.

Acquired included all cases where onset was recorded as gradual, or at a definite age, or associated with an alleged external cause (which must have been an adequate cause if the child was under one), or if there seemed to be no adequate cause, but some doubt as to whether onset *was* under one year of age. Blindness which was the result of accident or war service was excluded.

Age of onset.—Unlike deafness, acquired blindness is a condition that normally comes to people—if it comes at all—relatively late in life. Omitting ophthalmia neonatorum, the incidence of which is steadily diminishing, out of a total of 720 cases where the age of onset was recorded, nearly 60 per cent. became blind after the age of 40.

Rather more than 2 out of every 5 cases of congenital blindness had a syphilitic association, the rate of incidence of blindness of this class being

nearly twice as high among the unmarried as among the married over the age of 21.

Occupational class.—More than half the fathers in families containing a blind child were unskilled labourers, and nearly half the men who became blind after their youth had been of the same low grade when occupied, as compared with less than 40 per cent. so classed among normal working men. Those who become blind have much less chance of becoming self-supporting than the deaf. This is recognized by the granting of a pension to the blind at the early age of 50. Out of 198 occupied blind men on Merseyside no fewer than 121 were employed in special workshops for the blind. They could not hope to compete on equal terms in the open market.

Marriage and size of family.—The blind do not intermarry like the deaf, but their marriage rate is higher. Out of 943 adult blind persons in Liverpool 64 per cent. were married, as compared with 71 per cent. in the general population and 54 per cent. among the deaf. Among 603 marriages of the blind, both partners were blind in only 6 per cent. of the total as compared with 80 per cent. in the case of the deaf.

The mean number of living children per marriage resulting from 503 marriages where at least one partner was blind did not differ significantly from the mean number born to normal working-class parents. The mean number born to the congenitally blind was rather less than the number born to the acquired blind. And, in general, the earlier the onset of blindness the less the chance of marriage, and the smaller the average size of family.

The risk of a child of blind parentage being itself born blind is very slight, as in the parallel case of the deaf. The number of blind children resulting from 603 blind marriages was only 2.5 per cent. of all living children. But clearly, the handicap to any child born to a parent who is blind is bound to be great, so that one is disposed to question the advisability of the blind becoming parents. And there is always danger of transmission where the blindness is congenital. In the Merseyside Survey several families were reported in which blindness showed up in successive generations.

Turning now to marriages of a type which to all outward appearance were normal but which produced a blind child, the mean number of living children in 94 such marriages was 4.42 per family. This result may be compared with the mean number of living children in normal working-class families containing at least one child, namely, 3.39.

MENTALLY DEFICIENT.

Mental defect, as you well know, is a deficiency of intelligence, in the great majority of cases present at birth, though not always immediately discovered. Idiocy and imbecility, the more serious grades of defect, are liable to appear, as if by chance, in any class of the community. The feeble-minded (higher grade defectives), on the other hand, occur in patches, associated conspicuously, according to Dr. E. O. Lewis and others, with the Social Problem Group, the breeding ground of other problem types, such as the criminal, the immoral, paupers and unemployables.

Sources.

(1) The Education Departments of Liverpool, Bootle and neighbouring urban districts gave access to their records of all children between the ages of 5 and 16 attending special schools and classes for the mentally deficient.

(2) The West Lancashire Association for Mental Welfare supplied particulars of persons who were, or had been, under their supervision; these might be of any age, but only 6 per cent. turned out to be over 30. A child is placed under supervision only if likely to prove ineducable, even in a special school, so that the Mental Welfare Group is one suffering from a more serious grade of defect than the Special School Group.

Grade of defective.—The Special School Group contained 841 cases and the Mental Welfare Group 784, with a slight excess of males over females in each. The higher grade defectives come from a lower social class as judged by the father's occupation than the Mental Welfare Group; 63 per cent. of the fathers of mental defective children attending special schools were unskilled labourers, and 49 per cent. of the fathers of children under supervision were of this class.

Size of family.—The mean number of living children recorded in 1,115 families containing at best one mentally defective between the ages of 5 and 22 was 4.69. The corresponding figure in a large random sample of normal working-class families containing at least one child was 3.39. Moreover, about one half the total of families containing one or more defectives were families with 5 or more living children per family, whereas only one-quarter of the group of normal families sampled had each 5 or more children.

Not only are families containing one or more defectives larger than normal families, but the difference between them would be even more striking if all dead children could be brought into the calculation, for, in the 1,115 families recorded in the Merseyside Survey containing defectives, the mean number of children reported dead per family was as high as 2.47. This, incidentally, is evidence of poor physical stock as well as inferior environment. There is some ground for the belief that feebleness of body tends to go with feebleness of mind.

Transmission of Defect.

Among 1,880 defectives, concerning whom records were available, less than 1 per cent. had one or both parents certified as defective; as many as 15 per cent., however, had a parent judged to be of subnormal intelligence by head teachers of special schools or by experienced Mental Welfare Visitors. But if the parents of defective children are seldom themselves certifiably defective, it does not follow that the children of defective parents are most likely to be normal. In fact there is quite a strong chance that they will not be normal. Families containing a defective child included in the Survey were classified in such a way as to bring this out. In 24 marriages where both parents were judged to be subnormal, it was found that nearly 60 per cent. of their children also were subnormal. In 176 marriages where only one parent was subnormal, over 40 per cent. of the children were subnormal; while in 1,399 marriages where both parents appeared to be normal, 30 per cent. of the children were subnormal.

When there are two defective children in a family, either ineducable or attending a special school, there is little doubt that an hereditary taint must be present in one or both parents, outwardly normal though they may appear to be. No fewer than 217 such families were found on Merseyside. The mean number of living children per family in this group was 5.4, which may be compared with 3.98 per family in a large random sample of normal working class families each containing at least two living children. The mean number of dead children was also abnormally high, amounting to between 3 and 4 per family. In 58 of these 217 doubly-defective families, at least one of the parents was recorded as subnormal, and nearly one out of every three (32 per cent.) of these 58 families had 3 to 6 defective children apiece.

EPILEPTICS.

A total of 107 were included in our survey. Of these, 48 were children under 16 attending special schools or notified by the Liverpool Child Welfare Association. The rest were resident in the Maghull Epileptic Home. Eighty-one of the total sample were under 30. The fathers of 54 per cent. of the young epileptics were unskilled labourers. The mean number of living children per family was 4.4 and of dead 1.6 per family.

DEFECT IN NEAR RELATIVES.

By near relatives I mean parents and children, brothers and sisters, uncles, aunts, nephews and nieces, cousins and occasionally grandparents. Information beyond this range was doubtful.

Since deafness can be acquired, the extent to which acquired deaf persons have relatives also with deafness acquired may be taken as a guide to a measure of the chance occurrence of deafness. At least we may reasonably argue that the chance incidence of deafness is not likely to be greater than this. It might well be less because, owing to some hereditary weakness, the near relatives of deaf persons may be more prone to become deaf than the near relatives of hearing persons, although the immediate cause of deafness in both the primary case and in the relative of the primary might seem to be accidental. The same line of reasoning applies to the acquired blind, but clearly not to the congenitally deaf, the congenitally blind, or the mentally deficient.

Among 475 persons who had themselves become deaf, no more than 12, or 2.5 per cent. of the total, were recorded as having near relatives who had also become deaf. Among 845 persons who became blind, only 31, or 3.7 per cent. of the total, were recorded as having near relatives who had also become blind. Thus we might expect not more than about 2 to 4 per cent. of the congenitally deaf, blind, or mentally defective to have near relatives also deaf, blind, or mentally defective, respectively, as chance happenings. Actually, out of 471 congenitally deaf persons, 150, or 32 per cent., were recorded with congenitally deaf relatives. Out of 472 congenitally blind persons, 124, or 26 per cent., were recorded with congenitally blind relatives. Out of 1,625 mental defectives attending special schools or under statutory supervision, 383, or 24 per cent., had relations who were mentally defective, insane or

epileptic. The somewhat higher percentage of near relatives afflicted among the deaf, as compared with the blind and the defective, is due very likely to the high intermarriage rate observed between deaf persons. This would fit in with the simplest explanation one can offer for the high rate of like defects generally in the near relatives of the congenitally deaf, the congenitally blind and the mentally defective—far too high to be due to chance—namely, that there is an hereditary taint at work transmitted from one generation to another. And the figures I have quoted are not a full measure of the evil, for they only take count of the *fact*, not of the *number*, of near relatives affected. There may be more than one affected relative, or secondary, to the same primary case observed. It will suffice to illustrate this possibility by an examination of the mentally deficient class.

When we combined the Special School and Mental Welfare cases, making a total of more than 1,600, and counted the *number* of their defective relatives, we found that to every 100 primary cases observed, 37 near relatives were recorded as mentally defective, insane, or epileptic, and to this number 23 more were added, making a total of 60 affected relatives, secondaries, to every 100 primary cases observed, when relatives reported by skilled visitors as mentally retarded and unstable or subject to fits were included with the certifiably defective.

PHYSICALLY DEFECTIVE.

This group consisted of 662 children attending special schools under the Liverpool Education Authority or in tuberculosis institutes, or under the care of the Liverpool Child Welfare Association. They were subdivided into—

(1) Those with a congenital deformity, congenital heart, or congenital paralysis.

(2) Those with an acquired defect, such as rickets, tuberculous joints or glands, rheumatic heart, or infantile paralysis.

In addition to these 662 children, we came across 81 persons of all ages recorded as tuberculous, crippled, deformed, paralysed, or otherwise disabled, *not* as the result of accident, in the random household sample, and 345 persons suffering from ill-health, chronic or otherwise.

Occupational grade.—58 per cent. of the heads of families containing children with acquired defects were unskilled labourers; the corresponding percentage for the congenital group of physical defective children was 52 per cent. For the physical defective in the household sample it was 50 per cent. and for the sick it was 44 per cent. as compared with 39 per cent. in normal working-class families.

Size of family.—For all the physical defective groups combined the mean size of family was 4.33 children alive and 1.50 dead; for the sick the corresponding means were 4.90 children alive and 1.30 dead.

DELINQUENCY.

Under this head 109 juvenile offenders from the area were included, reported from reformatory schools and from the Borstal Association; also, 56 offenders under 50 years of age (but 60 per cent. were between 16 and 21), sent by the

Courts to the West Lancashire Association for Mental Welfare on the ground of mental deficiency.

Of those under 25, nearly 60 per cent. of the first group and over 30 per cent. of the second were reported to have come from homes where the father was dead or had deserted.

The occupational grade of the father was recorded in 91 families containing an offender in the combined grades; 55 per cent. were classed as unskilled.

The number of living children per family was recorded in 144 families containing a young offender in the combined groups; the mean was 5.5; and in 36 families where there was a record made of dead children, the mean number dead per family was 2.7. I should perhaps explain that special care was called for in filling up the space as to number of dead children. The space was to be left blank in all these investigations if there was no information as to number dead, and such cases were not included in the count. Only when it was known that no child had died was a "o" to be inserted in the space provided.

CHRONICALLY DESTITUTE.

Data concerning the destitute were collected with the collaboration of the Liverpool Public Assistance Authority. When we compared a random sample of families below a defined poverty line with normal families, it was found that by far the greatest causal factor in poverty at the period of the survey was unemployment, and the next important factor was the absence of any adult male earner by reason of death, illness, accident or some other cause.

In our subnormal survey we therefore decided to investigate two groups, defined as follows:

(1) A subnormal unemployed group comprising all able-bodied men, between the ages of 22 and 50, who at the time of the inquiry had been continuously in receipt of public assistance on the ground of poverty due to unemployment for two years or more. Men over 50 were ruled out because they might have been without work on account of the infirmities of advancing age. Also, anyone suffering from unemployment on account of sickness or accident was excluded.

(2) The second group was composed of deserted or separated wives, between the ages of 22 and 50, who had also been in receipt of public assistance for two years or more, excluding as before accident and sickness cases.

The total number of subnormal unemployed men satisfying the above definition was 754. Over 90 per cent. were married men as compared with 70 per cent. of men married between the same ages in the random household sample. Also, 71 per cent. were classed as unskilled labourers as compared with 39 per cent. among males in general in the household sample.

There were 283 women satisfying the definition of deserted or separated wives. A high proportion of their husbands, nearly 60 per cent., were seamen or ships' firemen, who had no difficulty in disappearing from sight if wife or home began to lose their attractions.

Size of family among the chronically destitute.—The mean number of living children per family for the subnormal groups is consistently higher than the mean number in the control group. With one slight exception, the same is true for the mean number of dead children per family.

ILLEGITIMACY.

The Liverpool Public Assistance Authority also gave us particulars of 200 women, each of whom had entered a public assistance institution for the birth of a second illegitimate child. Of these women 90 per cent. were under 35 years of age, one out of every three of whom was recorded as having had 3, 4, or 5 illegitimate babies; 43 per cent. were under 25 years of age, and one out of every five of these had had 3 or 4 illegitimate babies.

Of the 481 illegitimate babies born to the total of 200 women, 116 were known to have died—an abnormally high mortality rate.

Where there was any record of the father, the same man was alleged to be the father of 2 or more children born to the same woman in only 17 per cent. out of a total of 142 cases.

Among the 200 women investigated, 22 were reported as having no moral sense, 27 as mentally retarded, and 25 as physically defective or unstable.

GENERAL CONCLUSION.

From an examination of these subnormal types, collected from sources which were quite independent, whatever form the subnormality takes, whether the cases observed are below normal in hearing, or sight, or intelligence, or physique and health, or in such factors as make for employability and a successful home life, the general impression one gets is that they are discovered most frequently in the unskilled, labouring class and they occur in families which are above the average in size. It cannot be claimed, please note, that the subnormality is the cause of the descent into a low occupational grade when the subnormality is in the child and the occupational grade is that of the father.

Since, moreover, it may be taken for granted that only a low order of intelligence is required for unskilled labour, it would seem to follow that there is some degree of correlation between low intelligence in parents and subnormality in their offspring; it is in fact the most obvious connecting link, if a link be sought, with the parents, and the high fertility of such parents is not a hopeful sign for the future of our population.

These results, I venture to think, incidentally are not inconsistent with the trend of the conclusions reached by Sir Cyril Burt in his recent highly important study of *Intelligence and Fertility*; they are consistent, I mean, with the direction in which he thinks we may be moving, though I can say nothing at all precise, as he did, as to the estimated rate of movement.

His conclusions were that (a) it seems almost certain that there is in this country a negative correlation between innate intelligence and size of family,

large enough to demand urgent practical attention ; that (b) it seems highly probable that the average level of intelligence among the general population may be declining at a rate which might produce serious consequences if at all sustained ; and that (c) it seems more probable than not that, with characteristics other than intelligence (e.g. temperamental or moral qualities, such as relative freedom from neurotic or delinquent tendencies, and physical characteristics, such as health and strength), the effects of the differential birth rate are, if anything, unfavourable rather than favourable.

The reader is referred to Vol. 3 of the *Social Survey of Merseyside*, chapters 12-18, for a full account of the investigations briefly described in this paper.

HIGH GRADE MENTAL DEFICIENCY IN RELATION TO DIFFERENTIAL FERTILITY.*

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MR. CARADOC JONES this morning emphasized very clearly indeed the important distinction between high and low grade mental deficiency. He showed us some very striking figures suggesting, not that heredity is not involved in both, but that it is a different sort of heredity. It always seems to me that in considering this and related matters the analogy of stature is a helpful one. Many of us remember those posters of the last war but one, which said "Your King and Country Need YOU," coupled with the statement that "You" had to be 5 ft. 4 in. high—a standard which went down afterwards. If one rejects for any purpose a segment of the population on a measurement of this kind one is rejecting people for very different reasons. The arbitrary standard cuts off, of course, the dwarfs; the achondroplasics, the midgets, the cretins, the rachitic dwarfs, and so on; but it cuts off far more of those who are simply short. In causation we can normally expect the dwarf's condition to be due to hereditary factors, actually a single factor in achondroplasia,[†] or it may be something environmental, as in the rachitic dwarfs or the cretins, but when we come to the people who are just short, it has been shown fairly conclusively that in a civilized community in which the standard of nutrition is adequate, at least 90 per cent. of the differences are due to heredity; but it is a different sort of heredity. We have a whole host of genetic factors, each one of which has a small effect; but the effect is cumulative; some factors make for greater stature, some for smaller, and it is on the sum total received from the parents that the stature of the individual depends.

In mental development we have something rather similar, but our analogy is not yet complete because no one supposes that mental deficiency can be defined in terms of I.Q. or in terms of what Sir Cyril Burt calls innate cognitive ability, which is measured in children with fair success by a Binet test. It is important whether the person is stable or not temperamentally, and we have to say that our standard is no longer rigid; we exclude wholly everyone below 5 ft. 2 in., between 5 ft. 2 in. and 5 ft. 3 in. we exclude most, at 5 ft. 4 in. we exclude a few, above that we exclude very few; in other words, we exclude those who are short and notably lacking in other ways. Although with a certain measure of I.Q. we can be certain that the individual will require some sort of care and control, above that level decreasing numbers of persons will,

* A paper read at the Quarterly Meeting of the Royal Medico-Psychological Association at 11, Chandos Street, W. 1, on 21 February, 1947.

in fact, require care and control, whether they do or not depending upon emotional and temperamental factors which we cannot measure, or can only measure with the very greatest difficulty. I stress that because what I want to say refers to general intelligence and not to mental deficiency. It is relevant, of course, but it is not the whole story. It is the measurable thing, as measured with fair efficiency by the Binet I.Q., that I want to talk about.

If the frequencies with which different I.Qs. occur are plotted out the curve is normal down to an I.Q. of 45; we get the familiar "cocked hat" curve, which will include the great bulk of the defectives classified as feeble-minded; but below that level we find an excess—the 4 per 1,000 children found by Dr. Lewis in his survey—and so we have the low-grade defectives who owe their condition sometimes to a genetic factor, sometimes to purely extraneous things, sometimes to complicated interaction of factors which we do not understand, while on the other hand we have the dull, not separated in any sharp way from the rest of the population, but merely those who are socially inefficient and require care and control. The differences one expects to find between these two groups are not, I think, principally in their clinical characteristics. I think that Dr. Lewis has said since that he rather regrets that in that pioneer work of his he used the word "pathological" in distinguishing between the low-grade and high-grade, the pathological and subcultural, because it has to some slight extent tempted people to look for actual pathological deviations in the low grades and make that the criterion. I doubt if it is likely to be so. I do not suppose that the distinction is necessarily clear cut in that way, because though the very dull are, as it were, part of the normal curve, nevertheless one will expect, and I think find, that at that low level of mental development physical abnormality is often present, that neurological signs are present, that psychosis is present. The farther you go down the scale the more frequent these other abnormalities become, and this obscures a distinction which may be rather clear cut. The real distinction is likely to be in the family histories when we are able to study them in sufficient numbers and sufficient detail.

Some years ago my colleagues and I carried out a survey at Bath. We tried to obtain a complete sample of 3,400 school-children defined simply by age and residence in the city on a given date; and we did, in fact, by taking a good deal of trouble, succeed in making our sample practically complete. In it there were 13 children classified as idiots and imbeciles. It was true that two or three of them had similarly affected brothers and sisters, but not within the range of the brothers or sisters we could ascertain with certainty. In fact, the average I.Q. of the measured brothers and sisters of these 13 children was practically 100. The average I.Q. of the dullest 8 per cent. of our children was 72; the average I.Q. of their brothers and sisters was 88. Here we have in a very small sample this clear-cut distinction in the family history of the low-grade and high-grade.

One further thing we were able to do with our figures seems to throw some light on this distinction. In high-grade mental deficiency supposing one had influences which operated against a particular child, as there are in low-grade deficiency, then one would expect to get families in which one child only was

mentally defective and all the others more or less normal. If, on the other hand, certain sorts of environmental factors were very potent, one would expect to find them operating against whole families because the families would share those conditions. One would expect to get, on the one hand, an excess of families with one dull child and the rest normal, and at the other end an excess of families with all the children dull. This does not happen. In fact the distribution of intelligence of siblings of children in our group was just what would be expected from the simple assumptions of multifactorial inheritance, and the tendency for sibs to resemble each other.

What about the differential birth rate? In our population, as we know, different groups are reproducing at a very different rate. You heard this morning from Mr. Caradoc Jones some figures on occupational classes. The figures I want to give you refer to intelligence as measured on intelligence scales.

Amongst our group at Bath we selected for special study the brightest 4 per cent. of children in the group, and found that the number of living brothers and sisters they had was 1.70. We had to make an allowance, which can be calculated from the data, for the extra children which will be born to those mothers by the time they have passed the age of 50; this is 0.25, making altogether 1.95. In the middle 4 per cent. the average number of brothers and sisters was 2.78, others to be born 0.76, giving altogether 3.54. In the dullest 8 per cent. of children the average number of living brothers and sisters was 3.72, with an addition of 1.31, giving a total of 5.03. When ascertaining families in this way one starts, of course, with families in which there is at least one child, and one is more likely to include a family if it contains a large number of children. That seems a little complicated, but an approximate allowance is good enough; if the child who brought the family to notice is left out, the figures which remain are the effective family size; so that we can say that our brightest children come from families of average size 1.95; the dullest children come from families of average size 5.03—that is, families $2\frac{1}{2}$ times as large as those of the brightest children. That shows, in a nutshell, the differential birth rate in regard to intelligence. It is a linear relationship; as you go up the scale of mentality the size of the family falls perfectly steadily.

Where do the mental defectives come from? (I am talking of high-grade mental defectives.) Let us see how many children with an Intelligence Quotient below 70 (I choose 70 because Prof. Burt used 70) parents of different I.Q. levels will have? Without allowing for the fact that there is a strong tendency in intelligence for like to marry like, on the average a parent of I.Q. 130 will have only 0.1 per cent. of children with an I.Q. below 70 (plus the chance that 4 in 1,000 will be idiots or imbeciles); the chances of a parent with an I.Q. of 115 having a child below I.Q. 70 is 0.6; a parent of I.Q. 100 will have 2.3 per cent. of children below 70; a parent of 85 I.Q. 6.7 per cent. of children below 70; I.Q. 70, 15.9 per cent.; I.Q. 55, 30.9 per cent. That is where the very low I.Q. children are coming from, and, of course, low I.Q. has a very close relationship to high-grade mental deficiency.

Mr. Caradoc Jones told you that the lower the intelligence of the parent,

the lower the intelligence of the child on the average, but there are many more people who are dull than there are people who are actually feeble-minded. In fact, the bulk of the high-grade mental defectives do come, not from mentally defective parents, but from dull parents. There are many more people in the population of I.Q. 70 than of I.Q. 55, and we can be quite certain that there will be more children with an I.Q. below 70 born to those of I.Q. 85 than to those of I.Q. 55.

One cannot separate the problem of high-grade mental deficiency from the problem of intelligence levels in the entire population from top to bottom. I hope I am not quoting from something which Dr. Slater has not yet published, but he once said that one could never understand the stream as a whole if one concentrated one's attention on the foam at the top and the sludge at the bottom. This problem of the differential birth rate and high-grade mental deficiency is not a problem confined to the feeble-minded; it is a problem of intelligence levels in the entire population.

Given this differential birth rate, given the fact that children in the lower ranges of intelligence have more brothers and sisters, is it possible to deduce what the fall in intelligence of the population is likely to be if present trends continue? It can be done by an indirect calculation, making certain assumptions. I used to make some complicated assumptions about what was hereditary and what was not. Prof. Fisher pointed out that these complicated assumptions were unnecessary; he used a different formula and arrived at 2.0 points of Binet I.Q. per generation. Prof. Burt simplifies it yet further. Do not let us think of the parental generation and the generation of children; let us see what the difference is between the population as it is with all the differing sizes of families and with an average I.Q. about 100, and the intelligence of the population as it would be if all families were of equal size. Prof. Burt, using this method of calculation and making certain modifications and adjustments, comes to the conclusion that the fall in I.Q. is likely to be of the order of 2 points or so. Of the 2 points not less than half is likely to be hereditary causing a relative loss of valuable genes. That figure of 2 from my own data must be increased. Taking samples of school-children one is bound to get incomplete families, which increases the estimated fall to 2.6 points of Binet I.Q. per generation. If one guesses at the amount to allow for the people who do not appear in the survey at all because they have no children, then one might say 3 points of Binet I.Q. per generation.

That is far too big. If the average decline in intelligence in the population were 3 points Binet I.Q. per generation, we should have noticed a much bigger increase of mental deficiency in the last 25 years and a much greater decrease in scholarship children. Prof. Burt thinks that there has been a fall, but it is much smaller than the indirect calculation indicates. I will give you one possible reason which might account for that in a moment. Prof. Burt's figures are as follows—they all refer to people of I.Q. less than 70: In 1920 the estimated proportion in London was 1.5; in 1950, if we assume a fall of 2 points, it will be 2.3; by the year 2000 the percentage of the population with an I.Q. below 70 will be 4.1. Prof. Burt sums up by saying that it looks as though the proportion of people with I.Qs. below 70 is likely to double in the

next 50 years, and the corresponding proportion of scholarship children with I.Qs. above 130 is likely to be halved.

A number of factors may affect this indirect calculation, and I should like to mention some of them. One is the question of maternal age, and its effect upon intelligence. Maternal age and birth order are so closely related that it is difficult to distinguish between the two, but let us suppose that it does turn out to be unfavourable for the child and its level of intelligence to have a mother who is old or to be 6th, 7th or 8th in the family as compared with the first or second child. The effect would naturally be to give a higher mean I.Q. for the smaller families and a lower figure for the larger families; and it may be that a part of the effect we see when we try to relate fertility to intelligence is due to this factor. The results of experimental work are exceedingly confusing; Prof. Burt comes to the conclusion that only part of the association is likely to be attributable to this cause. But if it were big enough it could be entirely responsible, and it might be that instead of the intelligence of the population declining it would increase. I had hoped to present you with some figures from our own data, but I have not yet been able to work them out because it involves a good deal of restandardization of our norms with regard to age. I do not know what the answer is, but we have to bear in mind that it may be a measurable disadvantage on the average as regards intelligence to come late in the family or to be born to a relatively elderly mother, and this may account for part of the association between small size of families and intelligence. It may indeed be that this accounts for the discrepancy between the indirect calculation and the probable actual fall, which is considerably less.

The next factor which affects the calculation is a decline in inbreeding. During the last hundred years transport facilities have increased notably, the population has become not only much more numerous, but more mobile, and there has been a growing tendency for people to marry those who are less related to themselves. Someone had said (I do not know if the calculation is correct) that in this country some years ago the average marriage was one between fifth cousins. The degree of inbreeding has been steadily relaxed during the last hundred years. Does it affect this calculation? It certainly will affect the proportion we may expect of low-grade defectives, because some are due to Mendelian recessive genes, and so as inbreeding is relaxed we should expect a fall in the number of low-grade defectives. What about the high-grade defectives? It may or may not affect the numbers. Dahlberg in Sweden did some work years ago on stature amongst recruits in the Swedish Army, and he found that there had been a notable increase in stature over a period of years. He was convinced that this could not be attributed entirely to improvement in nutrition, and his theory was that it was due to precisely this factor—the relaxation of inbreeding. When hereditary factors are involved, such as are likely to apply to intelligence, it may be that on the whole the individual factors which make for higher intelligence are more often dominant, and if that is so less inbreeding would mean that similar recessive genes would not come together so often. This is all speculative, but it is not inconceivable that although the indirect calculation indicates a fall in intelligence in the population, although it is true that the dull have far more

children than the bright, yet that might still be combined with a rise in the general intelligence of the population. In one sense it is not a real rise ; it does not mean that the units of intelligence available in the population are increasing in number ; they are not ; they are decreasing, but they are arranged in a more useful order—the good are being used to conceal the bad.

People are not only marrying those who are less related to them, but they are marrying those who are more like themselves. It appears to be a strong universal tendency that like should seek out like, and in nothing is this more true than in intelligence. It is probably true to say that to-day the average husband and wife in our population are more like each other in intelligence through deliberate choice than are the average brother and sister because they were born of the same parents. The strong tendency of like to marry like is a very powerful factor, but one hundred years ago the choice of a marriage partner was far more restricted than it is to-day, and this tendency had less scope. It may be that the correlation coefficient of likeness in intelligence between husbands and wives is now as high as 0.6. The effect is to increase variability, and it is easy to see why. If the dull marry the dull there is a stronger tendency for their children also to be dull. Similarly with the bright, if the very bright tend to marry the very bright, then their children tend to be very bright. It does not alter in any way the average of the population or the units of intelligence available ; all that is happening is that they are being sorted out differently. The effect on these calculations may be considerable, and if the tendency increases it will increase the number of feeble-minded because it will increase the number of low I.Qs. Let us say we have a population with a mean Binet I.Q. of 100 and with a standard deviation of 15, then the proportion of people below 70 is 2.8 ; but supposing that population, without altering at all in average intelligence, has its variability increased by this assortative mating to a standard deviation of 17, then we should have 3.9 per cent of people with Binet I.Qs. below 70. The increase in the proportion of the feeble-minded would, however, be counterbalanced by a corresponding increase in the proportion of very bright children.

The last point I shall mention which affects this calculation is rather an obvious one. A low Binet I.Q., unless it is very low, does not mean that the person needs to be certified. Dr. Gordon and Dr. Thomas some years ago carried out a study at Bath and came to the conclusion that if a child at the age of 14 had a Binet I.Q. of not less than 60, and if that child were thoroughly stable and well adjusted, then he or she should be able to get on in the community without supervision. Emotional and temperamental factors, of course, come into the picture. This question of being well adjusted and stable is extremely important, and there may be developments in the next 50 years in regard to these other and varying important components in determining mental deficiency which requires certification. I entirely agree with Mr. Caradoc Jones about the positive association between good qualities of all sorts and bad qualities of all sorts. If we are losing units of intelligence which are available in the population we shall be likely to lose other things of value too. But we may be able to use what we have got to much better purpose. We know very little about the determination of emotional qualities which make for

stability and for the social success of the individual in the community. I am continually struck by the big difference in these qualities between identical twins, who have an absolutely identical hereditary constitution. I saw a pair of twin girls a month ago; they were unquestionably identical. The mother volunteered the information that they were absolutely different in character, and when she was asked why, said that one was very shy and sensitive and very fond of dolls, very fond of clothes, jewellery and dressing up; the other was self-reliant, did not care a hang about anybody, had no interest in clothes whatever, but was interested in mechanical things and ought to have been a boy. To make it more difficult, there was a size difference in these twins which had persisted since birth; it was the larger twin who was the shy, sensitive one, and the smaller one who was the more extraverted.

Another pair of identical twins, just about as identical as any twins one could ever see, are apparently similar in intelligence, extremely similar in appearance, and yet the mother describes one of them as neat and orderly, her room always kept in perfect order, while the other is careless about her possessions, her room always in confusion. These are fundamental differences, and yet they are differences in people with identical genetic constitutions. They are non-inherited differences, determined in some way we do not yet understand. We can surely look forward to advances in knowledge which will help in prescribing and obtaining the best conditions for development before birth, after birth, during school and training, which will mean that fewer and fewer of those who are potentially certifiable because of low intelligence will actually require it. We can hope that as the years go on, although there may be more very low intelligence in the population, fewer people will need to be certified and more will be able to live useful lives in the community.

DISCUSSION.

Dr. E. O. LEWIS said that he felt he was not in sufficiently close touch with investigations of recent years to be able to contribute very much to what had been said by the openers. He would like to make one point, however. Before becoming too pessimistic it would be well to ask whether such things as intelligence quotients were being interpreted correctly. Everybody regarded intelligence quotients as a measure of intelligence and intelligence only, that is, of innate mental endowment. It must be admitted that intelligence tests were influenced to a great extent by cultural levels and by temperamental development, and when there was a lowering in the intelligence quotient that lowering might not be due to the fact that intelligence, that greatly graded inherited factor, had changed very much, but that secondary factors were producing the lower intelligence. The recent work in America had shown that mental tests were influenced to the extent of 20 per cent. by factors which were not innate, and this must be taken into account before pessimism was admitted.

It was a very serious consideration if the quality of genes could be modified at the rate it was said they could be modified. He could not challenge the recent work, but he felt that they should make quite sure that they knew what they were dealing with when dealing with an intelligence quotient. He was inclined to think that what was thought to be a lowering of intelligence was a slipping back of cultural level to some extent.

His own thoughts on this subject had gone along rather different lines. What should interest them as psychiatrists was the variation and distribution of mental illness and mental abnormalities, and in his own investigations in 1925 and 1929 he found that in the distribution of mental deficiency one of the great disparities was

the difference in distribution in the rural and urban areas. From whatever angle data were collected he found that mental deficiency had an incidence at least 50 per cent. higher in the rural areas than in the urban areas. He did not mistake rusticity for mental retardation, being careful to avoid that obvious pitfall. At the same time, he did not say that the average level of intelligence was lower in the rural areas. If he did colleagues from across the border would soon correct any such tendency, because the Scottish Education Department applied educational tests throughout all the schools both in the rural and urban areas, and they found that the average level was not lower in the rural areas than it was in the urban areas, but as far as mental deficiency was concerned (and he did not think that the Scottish figures could give much evidence on this particular point because the test was a little too crude to differentiate the lower levels of intelligence) there was undoubtedly a higher incidence in rural areas. In investigating that data or that result he thought some very interesting sidelights were thrown on how mental deficiency cropped up. In the rural areas mental deficiency was to be found in very small pockets. In Cardiganshire, which was totally rural, the incidence of mental deficiency was high because there were a dozen or 15 small pockets of mental defectives, and when these were investigated it was found that there had been a great deal of migration from these districts to the urban areas. The brighter people had left the district and left a small group of retarded people to inbreed and produce defectives and throw up the incidence considerably. He wondered if there was a similar incidence of psychosis in the rural areas. The numbers in the mental hospitals were not a complete guide to the actual number of people suffering from psychosis, because a number of such patients were kept by the public assistance institutions, especially in an area such as Lancashire.

Coming to the towns the distribution of mental deficiency was very well marked. There, as Mr. Caradoc Jones and Dr. Roberts said, he found he was working in certain wards in the large towns where there were slums and poor surroundings, and there was a great disparity in the incidence of mental defect amongst the school population in the various schools; the ward which belonged to the professions had very few mental defectives. He soon found in the towns that mental deficiency was really a question of social stratum, and it struck him how much social deficiency there is which could not possibly be brought within the scope of the Mental Deficiency Act. Those who had read the Report of the 1905 Royal Commission would remember that people gave evidence thinking that the new Act would deal with all forms of social deficiency due to poor mental intelligence. With regard to crime one very responsible doctor said that 80 per cent. of recidivists were mental defectives, and many people thought that once the Mental Deficiency Act was passed the recidivists could be effectively dealt with, but it only enabled 5 to 10 per cent. of recidivists to be dealt with. There was a great deal of mental retardation which could not be brought within the scope of the Mental Deficiency Act, and the social inefficiency which could not be dealt with under the Mental Deficiency Act or any other Act produced most serious problems. Psychiatrists should address themselves to the group of people with I.Q.'s between 70 and 85, because from that group many of the most serious problems arose.

Dr. FERGUSON RODGER was very grateful to Dr. Lewis for his optimism. It was a serious thought which had been presented by three experts that by the year 2,000 there should be such a profound fall in the intelligence quotient. Dr. Lewis had raised the question whether this might not be largely cultural, and he found it difficult to understand how the experts seemed to ignore the striking work which was being done in America which showed the association between the intelligence quotient and culture. There was a correlation between the intelligence of children and their foster parents in the fact that there were such striking differences between the environments and the intelligence.

Another point which struck him as very important was the one which Prof. Penrose raised about stature—the fact that in Toronto at one time statisticians predicted, because the children of large families tended to be shorter than the children of small families, there would be a fall in stature in the next generation. He thought that these speculations that the I.Q. was falling was an affront to common sense. If these very large falls were expected it should be possible in the Scottish survey of intelligence of schoolchildren to come to some estimate as to whether the fall which had occurred since the last survey (in 1931) had occurred. The I.Q. test was subject to the culture in which it was performed and the culture

would change in 15 years and it was difficult to get a test which would act from one generation to another.

A further point was the fact that stature had been described in these genetic terms, other things, too, including infantile mortality. There was an echo of that in Mr. Caradoc Jones's paper, in which he said there was an association between feeble-mindedness and feebleness of stock. He drew attention to the fact that in the families of feeble-minded children there was a greater fatality, presumably that was due to bad care and environment; presumably there was genetic feebleness, but not so long ago the infantile mortality amongst the lower groups was described as due to feeble stock. They did not any longer believe that, but there was a suggestion of it here. There had been pessimism in the past about other things which, in the end, had turned out to be unjustified, and he had the feeling that it would turn out all right again.

Dr. NOEL BURKE said that they had seen the table of the possibility of 70 I.Q. children according to the I.Q. of the parents, but he thought it needed correction by the possibility of superior children being born to the same parents. He would like to see those figures put alongside in the same sort of table. It would help to adjust his views. The man who knew the figures might say that it followed automatically; he did not know. It had been said that it was bad to be born late in a family; he wondered if allowance had been made for the other finding of the statistical experts that the large family, on the whole, only came from people of poor quality, because if these two things were put together it seemed one would have to say that people who were sixth, seventh or eighth in the family were most likely to be people born of poor quality family and were already weighted adversely.

Then there was the question of social customs. There was no doubt that the probably more intelligent, certainly better-off families, had changed their habits and reduced their fertility. He was one of four, his father was one of seven, his father was one of a dozen, and his father was one of a dozen. Had the lower quality changed, or was there any evidence that they were changing their fertility habits? He had the impression that some were; it might be only the better ones of the so-called working classes who were beginning to reduce their families. One saw the better members of one's staff, for instance, having one, two or three children, and the not so good having six, five or four. Supposing there was some importance in the changing of social customs, was there any possibility that alteration of these customs would aid the alteration of the trend which the statisticians feared? If one studied the Births Column of *The Times* it would be found that people were having more children who at one time had one or none. All the young people out of the Services were determined to have children at the earliest possible moment, and he wondered whether there was a change in the feeling of taking the risk of having children in the classes which used not to take the risk.

Dr W. MAYER-GROSS did not wish to go into the matter of discussing optimism and pessimism in this respect, and he did not agree with Dr. Fraser Roberts that one could set these American experiences against the excellent work which had been done by a number of first-class workers in this country. He could not quite understand if Dr. Lewis thought that the intelligence test did express quite such a report, and one would expect with progressing civilization to get better results.

He wished to contribute something factual from a social survey in a rural area carried out in his department, and which would soon be terminated, and with regard to which he was very impressed by an observation which had been mentioned by Dr. Lewis. First of all, the figures of the dull and backward and the feeble-minded were even higher than Dr. Lewis had found 15 years ago. He was also impressed by the fact that these were found in groups and patches in the different country districts, and also by the fact that obviously the migration of the energetic people to the towns and other districts deprived the country of the more intelligent stock. He thought this depopulation of the qualitative stock was an enormous danger which could not be denied, and against which some measure of remedy should be found. He thought psychiatrists working in rural areas should, by their knowledge, try to counteract this depopulation of the rural districts.

One last word about the comparison between Dr. Lewis's figures and the figures of the Scottish Education authorities; he felt they could not be compared. Dr. Lewis's figures on mental defectives were mainly based on certification, while the Scottish investigation was a general investigation of the population, including all children, and that gave a very different picture. From his own rural district he

found that Dr. Lewis's findings were confirmed and that the Scottish figures of 1935 were contradicted. He did not know why this was, but thought the reason was partly that children under a special grade of intelligence were left out of the survey.

Dr. A. A. W. PETRIE said that there were one or two points he had hoped would be mentioned on the problems of social customs. There had not been any clear discussion yet on the point of social custom, namely, of contraception versus the problem of fertility, and these two things were not the same, because the problem of fertility in different types, classes, nations and so on was a very important one, apart from the social custom habit of tending to have fewer children in a higher stage of development. The mental defective had probably been less influenced by that social custom than had any other class. He remembered at one of the inquiries,—he thought it was the Brock inquiry about 12 or 15 years ago—Lord Dawson gave evidence that contraception had reached the level of the day labourer, a statement that 15 years ago was more liable to contradiction than it was to-day. To-day it would probably be accepted as a fact. The more intelligent type of parent wished to give each child a better chance in the world. The mental defective group would not be influenced by such considerations, and one still came across the 12 and 14 family which was so common 50 or 60 years ago. In that type of family there was nearly always the defective or the near defective. He did not know anybody who could collect families of 14 or 15 in the highly educated classes, whereas many could talk about their grandparents and great-grandparents having had a considerably number of children because the social habits had changed, and in a more competitive and struggling world they tried to give their children a better chance in life.

Dr. Roberts stated that owing to like marrying like the incidence was being differently distributed, and the speaker thought that information might be conveyed to the highest levels because it was said that a classless society was going to be set forth in England, and obviously the genetic factors and the trends of human nature, as one hardly needed to be told, were rather against it. The biological urge tended to segregate different types from each other intellectually as well as in every other factor.

One had hoped, perhaps, although it was such a factual informative meeting that one should not ask for it, that some recommendations would come out of it, that the Chancellor of the Exchequer might ease the burdens on certain types and so on, but this was something that this country had seriously to consider, how far they could take these trends. Were these trends natural? Dr. Rodger referred to the cultural levels. Had not the higher cultural levels tended, in history, to be diminished and be replaced by cruder types? The more cultured elements tended to be recruited from below and that might prevent, of course, the advancement of men towards the millenium, and might tend always to maintain the same sort of level. That really might be one very distinct factor, but as a nation it had to be considered how the good stocks could be improved and the bad stocks diminished, and that was something which Lord Dawson was most emphatic about. He said that the natural processes by which these less viable stocks ordinarily died out under an artificial system were obviated, and they were protected and flourished until they choked the whole nation. Something had to be done to compensate for the artificial maintenance of stock which under the natural law of the jungle would cure itself by dying out, owing to its inefficiency and poor vitality. He had always thought that it was important to have a man who could advise those in higher circles on what should be more than obvious.

Dr. Blacker gave a slight hint of the statistics which would be available in the next 20 or 30 years. He hoped these statistics would be kept as simple as possible, but he admired Dr. Blacker's optimism when he said that the medical man would complete the case-sheet the next day. At the same time, if they were to benefit by having a well-planned service, obviously the statistical section would be more than important for answering the many questions on the statistical research lines which could be answered if there were various assumptions on the lines Dr. Blacker indicated.

Dr. CRAWFORD thought it might be interesting to have a little clinical note; on the deficiency side he had been told that there was a different type of defective to deal with, especially in the higher grades. He mentioned this because of what Dr. Lewis had said with regard to the cultural and environmental side being more

important. There was not much difference in the Binet I.Q. point, but there was a large swing in that type. There was the defective who belonged to the sub-cultural group, who formed quite a large part of the patients; they were delinquents and their I.Q. showed them to be defectives, yet he would say that they were completely different. Their number was increasing. Inside the institution there were two classes, one a sub-cultural group and the other defectives as they knew them.

Dr. K. K. DRURY asked if the statisticians could give the other end of the table and bring it back to 1800, 1700 and 1600, and say what the ratio of defectiveness was then compared to what it was now. If it went from 1.5 to 1.4 in 100 years, by the time the calculations reached Elizabethan times they must have been supermen, and that was not so. It would be most interesting to know what was the proportion of mental defectives in the year 1400.

Dr. T. A. MUNRO said that Dr. Blacker gave in detail the method of obtaining some really useful facts about psychosis and numbers of patients suffering from mental disorder and all the various factors relating thereto. It was very right that he should do so. After he began to know a little about dealing with figures he was very impressed by the ease with which one could collect really valuable facts, or facts which were capable of being interpreted by quite simple means. He felt, however, that the number of facts which one had to collect on any form must be small and exceedingly simple. It was only too easy to go the other way and pile up a large number of facts about whose accuracy one had doubts, and therefore one had doubts on the value of any interpretation. Dr. Blacker also mentioned the value of the facts which might be compiled on a punched card for research. The speaker agreed, but would suggest that it would be more valuable to collect a small amount of correct data in the same form throughout for a more intensive survey and to concentrate rather on two or three hospitals or areas in England, perhaps a town and rural area, and there set up a definite research unit. Besides having the forms and the cards, one had to have the man or the team of workers who were really interested in finding out these things, and who would take care that the cases were adequately surveyed and the information obtained was correct. He would not like even to bother to read a paper which discussed family histories if he knew that these family histories had been written down by a patient in an out-patient room, while waiting to see a doctor.

Mr. Caradoc Jones, Dr. Fraser Roberts and Dr. E. O. Lewis mentioned the important surveys they had made. It was clear how valuable these surveys had been, because they continued to be quoted; they lived because the work in them was carefully compiled and, as Mr. Caradoc Jones had shown, they contained a vast number of facts. These facts, if they were carefully recorded, were always open to interpretation, and generally more facts could be dug out of the work done later on.

To come to one definite point, Dr. Fraser Roberts mentioned that a possible factor in the fall of I.Q. was the large size of the family or alternatively the late maternal age, and possibly one might take a more optimistic view of the fall if people in the future had fewer children and these large families did not occur. This was the kind of fact which could be dug out quite easily from Dr. Penrose's survey of mental defectives at Colchester. One would expect to find that there were more mental defectives among the later children of the mother than the earlier, or, alternatively, one would expect to find that there was an association of low intelligence with an older mother's age. That information could, he was sure, be obtained quite simply by merely looking at the appendix of Dr. Penrose's survey. He did not wish to misquote his former chief, but he thought he did show that that effect did not occur in families. The mental deficiency in the sibships was scattered throughout all the siblings, with the one exception of mongolism. That was the value of a survey which was carefully, correctly done and well recorded. The survey which he did in mental deficiency awaited being done in a mental hospital—he would pass it on to Dr. Blacker and Dr. Maclay.

He was glad to hear Dr. E. O. Lewis speak about his work in town and rural areas, because it reminded him of the work he did when he was to some extent under Dr. Lewis's charge on the Committee controlling his own work on consanguinity. It was striking in rural areas in Suffolk and the fen country to see social and cultural factors very dynamically at work. He met one doctor who had been 30 years in practice in a rural village and he told him how 30 years ago there

was a lot of inbreeding; the boys and girls never left the village; now they went on the 'bus to the local town 20 miles away and met the people they would marry. He remembered going to a house in the fens and meeting a grandparent who had never been to Cambridge, never seen the sea, or been to London, and he met parents who had been as far as London, and he met children who had been taken on a school tour to Holland. There was a much larger mixing of the population. Although he would agree that these social and cultural factors were strong and real, he could not go as far as Dr. Ferguson Rodger in saying that they were of more importance than purely hereditary factors. Dr. Fraser Roberts's work and Dr. E. O. Lewis's work proved scientifically that in general brainy parents had brainy children and dull parents had dull children, and if dull parents had more children than brainy parents then it was inevitable surely that there would be in the next generation a larger number of dull children. That did presuppose that the social and cultural factors remained the same, and he was sure that it was these neglected factors which were proving very much in a changing and dynamic society.

The PRESIDENT said that this was a very fundamental problem, and he thought that it had been necessary to present the facts in the way in which they had been presented. Suggestions had been made of an approach towards this problem, which was not merely a problem of psychiatry, but a problem for our nation if it was to survive at an adequate level. They could not be complacent about the situation; psychiatrists had not taken sufficient part in putting these problems of hereditary constitution and environmental structure; he did not think they had ever taught their medical students these facts, and it was surprising to find the ignorance of medical people in general in regard to questions which were not only of national but of great international significance if they were going to help a people which were going to have great difficulties in the future to contend with. That was why he felt that it was essential to build up a positive eugenic programme as fully as possible, and to inform not only their fellow medical men but the public in regard to matters which were striking at the structure of society.

Dr. BLACKER, in reply to the discussion, thanked the President for his expression of the importance of the symposium, although each contributor had touched on very different aspects of the general theme of the population. Most of the questions had been directed to the other two speakers, but he had jotted down one or two points which had a bearing on the questions which had been asked.

With regard to Dr. Munro's statement on facts and their value he could not agree more, and he was the last person to burden the doctor with more form-filling, but by organizing the records department it was possible to collect the data which were available and collate them in a way which had not been done in this country. The absence of mental health data compared to what was produced by other countries was something which there was a wonderful opportunity of remedying now. The mental health records could be made the best in the world with the changes which were promised.

He would agree with Dr. Munro that some of the facts which might be put forward might be of dubious value, and he distinguished between the demographic and the medical data. He had far less doubts in his mind as to the statistical value of the demographic data than he had of the medical data. He never suggested for a moment that a patient should be asked to fill in details of his family history while waiting to see the doctor; he suggested that the patient should be asked to recall the number of live siblings of his own and how many children, if any, he had got. Those two facts between them would enable them to work out all sorts of correlations relative to the fertility of these different elements in the population. It was extremely simple, and involved practically no extra work.

Where the difficulties would arise would be on the question of diagnosis. There was sitting at the moment a world conference to try to standardize diagnosis, and it was hoped eventually to produce agreement on a standardized list of diagnoses as between the U.S.A., Canada and this country, and when that list was perfected it was hoped, in theory, that the data from Canada, the United States and this country would be available, but when one examined the list of proposed psychiatric diagnoses one felt gravely disturbed as to the possible value of such comparisons, because he found there were, roughly speaking, 25 items divided into three main headings: psychoses, psychoneuroses and psychopathic personality. Under the heading "psychoneuroses" there was neurasthenia and hypochondriasis, and unless there was general agreement as to what conditions were covered by such

terms—neither of which was ever used at the Maudsley Hospital—what would be the value of the figures when they were compared and the statistics were worked out? This was where there would be muddles, much less than on the demographic data, unless the Committee gave an indication of the kind of case to which these labels should be attached. There would be large areas in which there would not be any neurasthenia or hypochondriac cases. The activities of the Committee would depend on its capacity to formulate fairly clear meanings of the terms they were proposing to adopt, and then persuading people who thought they were extremely bad and valueless to use them, which would be difficult.

Several speakers had mentioned cultural levels. He felt a great deal of sympathy with those who spoke about the influence of cultural levels on intelligence tests. He had read two books recently which had set his mind to work on the subject, one was called *The Oregon Trail*, which consisted largely of an account of the wanderings of a tribe of Indians. The buffalo provided their food, accommodation and clothes, and they fought against the neighbouring tribes. The chief of a village was a magnificent human specimen, who had over 30 squaws of his own; there was nothing to prevent anyone assassinating him except that the whole family would have a vendetta against the killer. The chief was the most warlike, most vindictive man and, incidentally, the most prolific. Suppose one was to take a Binet I.Q. of a tribe of Indians; the result would seem to show that they had not very much intelligence, but the intelligence was different and the scale of tests would have to be different. The other book was Mr. Frank Lorimer's study of the population of Russia. The majority of the population of the U.S.S.R. was illiterate in the time of the Tsars; the literacy had now been raised to something like 70 to 80 per cent., and that would make a difference to the capacity of doing the test. If the Binet test was given to an unselected sample of children in a Russian village under the Tzar they would do a great deal worse than they would do to-day. The education that they had received would make a great deal of difference. One felt that the tests themselves would undoubtedly undergo modifications, and it was part of the plan of the Scottish Education Committee that regular tests should be carried out at intervals and that new ones should be introduced as time went on, so that it was necessary to feel that the technique of testing was capable of improvement. It was difficult to standardize the results of the tests, and be quite sure that the conditions were similar when making two investigations separated by a long interval.

Dr. Petrie raised a fundamental question when he said that the remedies had not been discussed. He had intended to say something which would touch on that subject, but it was an immense subject. The cultural pattern was being altered at the moment in a significant way in certain countries. He was thinking of France, where, as a result of the introduction of enormous family allowances, fertility had shot up. A great many of the patterns prevalent in 1939 were now changing, and there was an exceptionally enlightened school of French demography which was studying these matters. The Royal Commission on Population which began sitting in 1943 had all these questions before it.

Dr. Fraser Roberts, Dr. Aubrey Lewis and the speaker gave evidence before the Commission and he was a member of their Biological Sub-Committee, and this matter was very much before their minds. The word "demography" and the population studies should cover not only quantitative considerations, but qualitative considerations. It was of interest that Sir Cyril Burt's Memorandum, to which many references had been made, was originally submitted by him as a Memorandum to the Royal Commission on Population.

The policy side of this matter was being extremely closely studied by the Royal Commission, and when the Report appeared—it was promised for this year—it would be found that recommendations on policy emerging from its findings would not be omitted and they would have something significant to say on the subject.

MR. CARADOC JONES said that there was one point which was raised in regard to the high mortality rate among defectives, and it seemed that he gave the impression that the whole of it was due to poor stock. He did not mean to do that. Some of that high mortality was undoubtedly due to the less care which was taken by less intelligent parents of their children and the environment in which they lived. One speaker put his finger on the right explanation of the difference in size in family as between the less intelligent and the more intelligent. He thought it was to a large extent explained by the fact that the more far-seeing parents tended rather to

restrict the size of their family, being anxious to give them a good education and so on, and the less intelligent did not look to the future at all and so they did not limit the size of their families.

Dr. FRASER ROBERTS said that many interesting points had been raised in the discussion, some of which had already been replied to. It was impossible to deal with them all, but he would mention a few. First of all he would like to deal with the point of projecting the calculations into past years and whether the population was a race of supermen in Elizabethan times. It was certain that the trend in differential fertility could only have existed in its present force for a comparatively short time. It dated from the serious decline in the European birth rate which started in 1870. There was good evidence that there was something of the kind long before that but it was weaker, and it might be that the trend in previous centuries was more than counterbalanced by differential mortality.

Dr. Burke asked about the table showing the highly intelligent children born to people at these different I.Q. levels ; it was exactly the same table turned round the other way. Dr. Ferguson Rodger mentioned the American work showing the cultural and environmental differences could affect the results of intelligence tests. There was nothing very new in that, Prof. Burt had done quite a lot of work on that subject and he showed that there were these effects. What he emphasized in his recent pamphlet was not that cultural levels did not affect mental tests, but that in good mental tests one did as far as possible equalize. The Ohio work had been so destructively criticised that it was not worth quoting. It was replete with statistical inaccuracies. The work was really highly unreliable.

Dr. Munro's answer to Dr. Ferguson Rodger put the whole thing in a nutshell ; the plain fact was that if the more intelligent were having fewer children the less intelligent were having more, and if inheritance had anything to do with it at all then the units making for high intelligence were being lost. Nothing would get over the seriousness of the loss of these basic units.

He would add one remark to what Dr. Blacker and Dr. Munro said about records. He agreed that records should be simply a few facts well ascertained.

The PRESIDENT moved a hearty vote of thanks to Dr. Blacker, Mr. Caradoc Jones and Dr. Fraser Roberts for a very interesting discussion, which was accorded by applause.

HEAD INJURIES : A NEW TREATMENT FOR THE POST-CONCUSSIVE SYNDROME.

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GUNSHOT and shrapnel wounds of the head during the war have produced various disabilities not commonly seen in the injuries of peace-time.

The symptom complex which usually appears subsequent to head trauma has become very familiar during the past few years. The resemblance from case to case of certain sequelae to head injuries has been grouped together in syndromes, variously labelled post-concussive syndrome, post-traumatic personality change, post-traumatic neurosis and post-contusional state, all indicating an oft-recurring persistent disability following concussion of the brain.

Many different types of investigation have been carried out, and in each instance some light has been shed on some particular phase of the symptom complex.

PATHOLOGY.

Definite pathologic changes in this syndrome have not been fully established. While various investigators believe the disorder is primarily of an organic nature, other observers have advanced evidence of its being a pathophysiologic derangement. Neustatter (1) has demonstrated the difficulty in deciding whether the syndrome is physiogenic or psychogenic.

The definition of concussion as presented by Strauss and Savitsky (2) is broad enough to allow for many of the theories of its pathophysiologic—“a series of events resulting from a blow to the head severe enough to cause disruption of intracranial equilibrium.”

It has been suggested by several investigators that the effects of cerebral trauma may be cumulative. As far back as 1874 Koch and Filene (3) proved that animals could be killed by repeated small blows on the head without showing evidence of any structural damage to the brain.

Martland (4), in 1928, recognized a condition occurring among prize-fighters which he named “punch drunk,” and which was attributed to the repeated head punishments they had suffered while in the ring. Later, Shaller, Tarnaki and Newman (5) showed the apparent increase of vulnerability of the cerebral vessels induced by the application of repeated blows.

More recently Denny Brown and Russell (6) demonstrated that paralysis of respiration of increasing duration and rise of blood pressure occurred with successive blows, and that concussion could be obtained readily by repetition of moderately severe blows.

Penfield (7) has advanced the theory that the development of dural adhesions is the basic cause of the symptoms, and has demonstrated in a number of cases thin adhesions in the subdural hemisphere. Histologically these lesions are composed of a thin layer of blood undergoing the process of organization and adherent to the arachnoid as well as the dura. On pressure being applied, by means of a curved instrument on the under-surface of the dura during the course of an operation under local anaesthesia, the patient complained of a head pain of the same character as the chronic headache of a post-concussive syndrome. In such cases, apparently, the exciting agent may be either constant traction or pressure on a sensitive area in the under-surface of the dura. Penfield also believes that during the actual trauma the brain is temporarily "knocked out" of position by the blow, and when the normal relationship is restored, traction adhesions are formed. These findings induced him to adopt lumbar air insufflation as treatment.

Zacks (8) has given adequate proof of degenerative changes in the cells themselves, which bring about an altered physiologic state. He believes it probable that there is a change in the irritability of the vasodilators and vasoconstrictors, with resultant areas of localized altered circulation.

Glaser (9) agrees with this theory, and adds that these changes are transient and may be actively reversible.

Courville (10) suggests that the mental changes often seen as part of this condition are primarily vaso-motor phenomena.

A striking liability of headache, localized to the site of previous scalp injury, to provocation by posture or physical effort, provides evidence that such provocation in the more diffuse types of headaches indicates underlying structural damage. Provocation by histamine, particularly when the headache has been unilateral, suggests that intracranial localized vascular or perivascular changes may occur (Brenner, Fieldman, Merritt and Denny Brown, 11).

Ruesch and Bowman (12) state that in head injuries the organism seems to respond more slowly and less extensively to stimulations requiring metabolic and circulatory adjustments. They consider it might be worth while to investigate further biochemical and circulatory aspects in post-traumatic conditions, thus reducing the number of cases whose symptoms have been explained on a "psychogenic basis."

Kozol (13) found little or no correlation between pre-traumatic personality and liability to development of post-traumatic mental symptoms.

A post-traumatic condition cannot be regarded as a definite purposive reaction to trauma of a very varying nature. "The change that has escaped notice is that the psychogenic stimuli which now produce symptoms would not have been effective before the injury" (Sargant and Slater, 14).

We are presenting additional proof in support of Malone's (15) evidence that such vascular pathophysiologic changes play an important if not dominant role in this symptom complex.

DIAGNOSIS.

Psychiatric symptoms are common among the sequelae of head injuries. These symptoms vary in intensity and duration from case to case. At one extreme may be increased irritability and occasional headache. At the other extreme may be a fully developed syndrome. The post-concussive syndrome usually presents a triad of symptoms—headaches, dizziness and various emotional disturbances.

A series of 88 soldiers who had suffered head injuries with unconsciousness was investigated at Sutton Emergency Hospital. As some months, and in some cases years, had elapsed before the admission of such cases, in all instances defects were of such severity and duration as to render the patient incapable of existing satisfactorily in his previous environment, and the fact that in 44.3 per cent. of cases symptoms had existed for a year or more seemed to indicate a poor prognosis.

This group of individuals showed a superficial uniformity of symptoms. Headaches, dizziness, disturbances of feeling and behaviour with vasomotor and emotional instability, impaired efficiency and fatigue were the commonest complaints related to the disability, particularly to prolonged disability. Many were handicapped through memory defects, defects in intellectual capacity and ability to concentrate, or through personality changes, such as moodiness and irritability (Table I).

Of the total number examined, 6 had suffered two head injuries, 4 cases had had three, and 1 case four.

The time which had elapsed between the accident and the date of admission to hospital is shown in Table I. Twenty-five patients were admitted within six months of the accident, 27 from six to twelve months after, and 20 from one to two years after. In addition, 16 patients were admitted at periods of from two to seven years following trauma.

Fifty patients developed symptoms immediately following the accident, 17 from one to two months after, 4 within three months, 4 after an interval of from three to four months, and 2 within six months. In the remainder the onset was gradual.

Forty-eight patients had had previous hospital treatment for varying periods with little or no benefit.

Patterson, Raynall and Kremer (16) recently discussed various aspects of the development of post-traumatic personality disorders, and made it clear that disturbances of even mild degree may have serious consequences, therefore early hospital treatment is advocated.

THERAPY.

The rehabilitation of such men who had undergone combined organic and psychic injury has provided a serious problem during the war, an organic injury rarely occurring without concomitant psychologic effects. Because of the fact that psychogenic factors frequently complicated the clinical picture, many of these patients were unfortunately labelled neurotic.

Treatment so far has been carried out on no approved lines, and there has

Case.	Age.	Date since injury.	Fracture.	Unconscious.	Post-traumatic amnesia.	Headaches.	Dizziness.	Symptoms.	
								lack of concentration, memory impairment, irritability.	Emotional instability.
1	40	3 yrs.	+	15 mins.	1 day	+	+	+++	+++
2	23	4 mths.	+	4 hrs.	Days	+	+	++++	++++
3	27	18 wks.	+	10 mins.	..	+	+	+++	+++
4	38	4 yrs.	..	15 mins.	..	+	+	++	++
5	31	6 yrs.	..	30 mins.	3 days	+	+	+++	+++
6	25	6 mths.	..	20 mins.	..	+	+	++	++
7	34	11 mths.	..	7 hrs.	..	+	+	++	++
8	35	1 yr.	+	1 hr.	1 day	+	+	+++	+++
9	44	4 yrs. 6 mths.	+	2 days	..	+	+	+++	+++
10	52	1 yr. 10 mths.	+	5 hrs.	Days	+	+	++++	++++
11	34	10 wks.	..	45 mins.	Hours	+	+	++	++
12	22	9 mths.	..	5 hrs.	3 days	+	+	+++	+++
13	27	8 mths.	..	7 hrs.	..	+	+	+++	+++
14	25	8 mths.	..	15 mins.	Dazed	+	+	+++	+++
15	20	10 wks.	..	2 hrs.	Hours	+	+	+++	+++
16	38	6 mths.	+	2 hrs.	24 hours	+	+	+++	+++
17	35	2 yrs. 6 mths.	..	12 hrs.	..	+	+	+++	+++
18	27	21 wks.	..	5 mins.	Dazed	+	+	+++	+++
19	24	1 yr.	..	10 mins.	..	+	+	++	++
20	22	3 mths.	..	20 mins.	2 weeks	+	+	++++	++++
21	31	21 wks.	+	10 mins.	3 days	+	+	++	++
22	31	4 wks.	..	5 mins.	48 hours	+	+	++	++
23	24	1 yr. 7 mths.	+	1 hr.	Hazy for days	+	+	++	++
24	39	2 yrs.	..	10 mins.	..	+	+	++	++
25	25	2 yrs.	..	35 mins.	..	+	+	+++	+++
26	23	1 yr.	..	30 mins.	..	+	+	++	++
27	21	6 mths.	+	2 hrs.	Dazed for time	+	+	+++	+++
28	25	61 wks.	..	10 mins.	..	+	+	++	++
29	23	7 yrs.	+	3 hrs.	Hazy for days	+	+	+++	+++
30	26	10 wks.	+	5 mins.	..	+	+	++	++
31	26	4 yrs.	+	15 mins.	2 days	+	+	++++	++++

Examination.						Result.
Ocular fundus.	Tinnitus.	Nystagmus.	Vision.	Number of injections		
Normal	No	None	Normal	17		Gradual relief of symptoms with complete recovery. No recurrence 6 months after.
"	Yes	Spontaneous rotary	"	20		Rapid recovery with relief of all symptoms. Had 3 head injuries. No recurrence 3 months after.
"	No	None	"	16		Complete relief of all symptoms.
"	"	"	"	20		Rapid recovery with relief of all symptoms.
"	"	"	"	19		Gradual relief of all symptoms. No recurrence 8 months after.
"	"	"	"	14		Gradual improvement with complete recovery.
"	"	"	"	12		Complete relief of symptoms. No recurrence 3 months after.
"	"	Spontaneous lateral	Presbyopia	16		Rapid recovery with relief of all symptoms.
"	"	None	Normal	20		Gradual relief of all symptoms.
"	Yes	Bilateral rotary spontaneous	"	21		Gradual improvement with ultimate complete recovery.
"	No	None	Hypermetropia	16		Relief of all symptoms except emotional instability.
"	"	"	Normal	20		Gradual relief of all symptoms. No recurrence 4 months later.
"	"	"	"	18		Complete relief of all symptoms.
"	Yes	"	"	15		Rapid recovery with relief of all symptoms.
"	"	"	Refractive error	20		Relief of all symptoms except emotional instability.
"	No	Lateral	Normal	17		Gradual relief of all symptoms, with complete recovery.
"	"	None	Presbyopia	14		Complete relief of all symptoms. No recurrence 7 months after.
"	"	"	Normal	18		Gradual relief of all symptoms, with complete recovery.
"	"	"	"	14		Gradual improvement with ultimate complete recovery.
"	"	Bilateral rotary spontaneous	"	16		Gradual relief of all symptoms, with complete recovery. No recurrence 6 months after.
"	"	None	"	14		Rapid recovery with relief of all symptoms.
"	Yes	"	Refractive error	16		Complete relief of all symptoms.
"	No	"	Normal	18		Gradual improvement with eventual complete recovery.
"	"	"	"	14		Complete relief of symptoms. No recurrence 6 months after.
"	Yes	Lateral	"	17		Rapid recovery with relief of all symptoms.
"	No	None	"	17		Complete relief of symptoms. No recurrence 5 months later.
"	"	"	"	15		Gradual relief of symptoms, with complete recovery.
"	"	"	Presbyopia	18		Rapid recovery with relief of all symptoms.
"	Yes	Bilateral spontaneous rotary	Refractive error	20		Gradual improvement with eventual complete recovery. No recurrence 6 months after.
"	No	None	Normal	16		Rapid recovery with relief of all symptoms.
"	Yes	Spontaneous rotary	"	18		Relief of all symptoms except emotional instability.

Case.	Age.	Date since injury.	Fracture.	Unconscious.	Post-traumatic amnesia.	Symptoms.			
						Headaches.	Dizziness.	lack of concentration, memory impairment, irritability.	Emotional instability.
32	33	4 mths.	..	10 mins.	Dazed for time	+	+	..	++
33	32	11 mths.	+	1 hr.	Hours	+	+	..	+++
34	40	3 mths.	..	3 hrs.	1 day	+	+	..	++
35	27	3 yrs. 10 mths.	+	5 days	Dazed for time	+	+	..	++
36	24	7 mths.	..	30 mins.	..	+	+	..	++
37	31	4 yrs.	..	15 mins.	..	+	+	..	++++
38	25	1 yr. 4 mths.	..	1 hr.	Dazed for time	+	+	..	++
39	28	1 yr. 5 mths.	..	35 mins.	Hours	+	+	..	++
40	26	5 mths.	+	10 mins.	1 week	+	+	..	+++
41	21	10 wks.	..	45 mins.	..	+	+	..	+
42	27	14 wks.	..	2 hrs.	Dazed for time	+	+	..	+++
43	20	19 wks.	..	4 hrs.	Ditto	+	+	..	++
44	23	7 mths.	..	10 mins.	..	+	+	..	+++
45	27	4 mths.	..	15 mins.	..	+	+	..	+++
46	21	9 mths.	..	20 mins.	..	+	+	..	+++
47	29	18 mths.	..	10 mins.	..	+	+	..	++
48	28	18 mths.	..	7 hrs.	..	+	+	..	+++
49	21	13 mths.	+	30 mins.	4 days	+	+	..	+++
50	26	11 mths.	+	20 mins.	24 hours	+	+	..	++++
51	32	7 mths.	+	6 hrs.	1 week	+	+	..	++++
52	27	9 mths.	+	8 mins.	24 hours	+	+	..	+++
53	26	54 wks.	+	3 days	..	+	+	..	++
54	31	7 mths.	+	30 mins.	10 days	+	+	..	+++
55	35	5 mths.	..	10 mins.	Dazed for time	+	+	..	++
56	38	4 yrs.	+	17 hrs.	..	+	+	..	+++
57	29	4 mths.	..	6 hrs.	6 weeks	+	+	..	++++
58	39	3 yrs. 4 mths.	+	1 day	..	+	+	..	++++
59	25	3 yrs. 1 mth.	..	20 mins.	Dazed for time	+	+	..	+++
60	23	6 yrs.	+	1 day	3 days	+	+	..	+++

Ocular fundus.	Examination.				Number of injections.	Result.
	Tinnitus.	Nystagmus.	Vision.			
Normal	No	None	"		10	Rapid recovery with relief of all symptoms.
"	"	"	Refractive error		15	Rapid recovery with relief of all symptoms.
"	Yes	"	Normal		15	Complete relief of all symptoms.
"	No	Spontaneous rotary	"		21	Gradual improvement with ultimate complete recovery. No recurrence 6 months after.
"	"	None	"		16	Complete relief of all symptoms.
"	"	Bilateral rotary spontaneous	"		44	Gradual improvement with ultimate recovery except emotional instability.
"	"	None	"		14	Rapid recovery with relief of all symptoms. No recurrence 3 months after.
"	Yes	Lateral	"		18	Gradual relief of symptoms with complete recovery. No recurrence 4 months after.
"	"	Spontaneous rotary	Presbyopia		15	Complete relief of all symptoms.
"	No	None	Normal		15	Complete relief of all symptoms.
"	Yes	Bilateral spontaneous rotary	Refractive error		14	Relief of all symptoms except emotional instability. Improvement maintained 6 months after.
"	No	None	Normal		16	Rapid recovery with relief of all symptoms.
"	"	"	"		15	Gradual improvement with ultimate complete recovery.
"	"	None	Normal		14	Rapid recovery with relief of all symptoms.
"	"	"	"		14	Rapid recovery with relief of all symptoms.
"	"	Lateral	"		12	Complete relief of all symptoms. No recurrence 7 months after.
"	Yes	Spontaneous rotary	Refractive error		16	Gradual improvement with ultimate complete recovery. No recurrence of symptoms 4 months later.
"	"	Bilateral spontaneous rotary	Normal		18	Gradual relief of all symptoms with complete recovery.
"	No	None	"		20	Gradual relief of all symptoms except emotional instability.
"	Yes	Spontaneous rotary	"		19	Gradual relief of all symptoms except emotional instability.
"	"	Lateral	Hyper- metropia		19	Gradual improvement with ultimate complete recovery. No recurrence of symptoms 7 months later.
"	No	None	Normal		17	Gradual relief of all symptoms with complete recovery.
"	Yes	"	"		19	Gradual relief of all symptoms with complete recovery. No recurrence of symptoms 4 months after.
"	No	"	"		14	Rapid recovery with relief of all symptoms.
"	"	Spontaneous rotary	"		20	Gradual relief of all symptoms with complete recovery. No recurrence 8 months after.
"	Yes	Lateral	Refractive error		18	Gradual improvement with relief of all symptoms except emotional instability.
"	No	Bilateral spontaneous rotary	Normal		20	Gradual improvement with ultimate complete recovery. No recurrence of symptoms 6 months after.
"	"	None	Presbyopia		21	Gradual relief of symptoms with ultimate complete recovery.
"	Yes	"	Refractive error		23	Gradual relief of all symptoms. No recurrence 6 months after.

Case.	Age.	Date since injury.	Fracture.	Unconscious.	Post-traumatic amnesia.	Symptoms.		
						Headaches.	Dizziness.	Emotional instability, lack of concentration, memory impairment, irritability.
61	21	2 mths.	..	30 mins.	..	+	+	+++
62	26	3 yrs.	..	8 hrs.	2 days	+	+	++++
63	24	1 yr. 9 mths.	..	2½ hrs.	1 day	+	+	+++
64	27	4 mths.	..	40 mins.	..	+	+	++
65	29	1 yr. 3 mths.	..	1¼ hrs.	..	+	+	+++
66	30	5 yrs.	..	1 hr.	..	+	+	++++
67	39	1 yr. 1 mth.	..	2 hrs.	..	+	+	+++
68	25	1 yr. 6 mths.	+	8 hrs.	1 week	+	+	+++
69	29	9 mths.	..	20 mins.	..	+	+	++
70	32	7 mths.	+	3 days	3 months	+	+	++++
71	27	1 yr. 5 mths.	-	30 mins.	..	+	+	++
72	26	47 wks.	-	10 mins.	Dazed for time	+	+	++
73	31	19 wks.	-	1 hr.	..	+	+	++
74	37	14 wks.	+	7 hrs.	1 day	+	+	+++
75	22	7 mths.	-	10 mins.	..	+	+	++
76	42	2 yrs.	+	3 hrs.	Dazed for time	+	+	+++
77	35	3 yrs.	+	6 hrs.	1 week	+	+	+++
78	45	1 yr. 3 mths.	+	30 mins.	Hours	+	+	+++
79	27	9 mths.	..	2 hrs.	..	+	+	++
80	29	7 mths.	..	1¾ hrs.	..	+	+	+++
81	25	1 yr. 2 mths.	..	25 mins.	Dazed for time	+	+	++
82	31	11 mths.	..	30 mins.	..	+	+	++
83	28	1 yr. 4 mths.	..	2¼ hrs.	Dazed for time	+	+	+++
84	23	5 mths.	..	1½ hrs.	..	+	+	++
85	29	31 wks.	..	45 mins.	..	+	+	++
86	30	11 mths.	+	3 hrs.	Dazed for time	+	+	+++
87	32	23 wks.	..	30 mins.	..	+	+	++
88	35	27 wks.	..	1½ hrs.	..	+	+	+++

Examination.

Ocular fundus.	Tinnitus.	Nystagmus.	Vision.	Number of injections.	Result.
" .	No	"	Normal	19	Gradual improvement with ultimate complete recovery.
" .	Yes	Spontaneous rotary	Myopia	24	Gradual relief of all symptoms except emotional instability. No recurrence of symptoms 5 months after.
" .	No	Lateral	Normal	15	Complete relief of all symptoms. No recurrence 7 months after.
" .	"	None	"	15	Rapid recovery with relief of all symptoms.
" .	"	"	"	15	Rapid recovery with relief of all symptoms. No recurrence 6 months after.
" .	Yes	Spontaneous rotary	"	22	Gradual relief of all symptoms except emotional instability. No recurrence of symptoms 6 months after.
" .	"	Lateral	"	18	Gradual improvement with ultimate complete recovery.
" .	No	Bilateral spontaneous rotary	Myopia	20	Gradual relief of all symptoms with ultimate complete recovery. No recurrence of symptoms 6 months after.
" .	"	None	Normal	16	Rapid recovery with relief of all symptoms.
" .	Yes	"	"	24	Gradual relief of all symptoms except emotional instability. No recurrence 4 months after.
" .	No	"	"	18	Gradual improvement with ultimate complete recovery.
" .	"	"	"	15	Rapid recovery with relief of all symptoms.
" .	"	Spontaneous rotary	"	18	Rapid recovery with relief of all symptoms.
" .	Yes	Bilateral spontaneous rotary	Refractive error	20	Gradual relief of all symptoms with ultimate complete recovery.
" .	No	None	Normal	19	Rapid recovery with relief of all symptoms. No recurrence of symptoms 6 months after.
" .	Yes	"	"	25	Gradual improvement with eventual complete recovery. No recurrence of symptoms 6 months after.
" .	"	Spontaneous rotary	Refractive error	24	Gradual improvement with ultimate complete recovery. No recurrence of symptoms 4 months after.
" .	"	Lateral	Normal	16	Complete relief of all symptoms. No recurrence of symptoms 3 months after.
" .	No	None	Presbyopia	15	Rapid recovery with relief of all symptoms.
" .	Yes	"	Normal	14	Rapid recovery with relief of all symptoms. No recurrence of symptoms 4 months after.
" .	"	Spontaneous rotary	"	16	Gradual relief of all symptoms with ultimate complete recovery. No recurrence of symptoms 3 months after.
" .	No	Lateral	Myopia	16	Rapid recovery with relief of all symptoms.
" .	Yes	Bilateral spontaneous rotary	Refractive error	20	Gradual improvement with ultimate complete recovery. No recurrence of symptoms 3 months after.
" .	"	None	Normal	15	Rapid recovery with relief of all symptoms.
" .	No	"	"	18	Gradual improvement with ultimate complete recovery. No recurrence of symptoms 3 months after.
" .	Yes	Spontaneous rotary	"	20	Gradual improvement with relief of all symptoms. No recurrence 4 months after.
" .	No	None	"	14	Rapid recovery with relief of all symptoms.
" .	"	"	"	15	Rapid recovery with relief of all symptoms.

been uncertainty as to choice of therapeutic procedures. Penfield (17) in 1927 introduced the procedure of lumbar air insufflation, which was, and still is, employed by some clinicians. The purpose is to have the air break up the subdural adhesions. In cases which proved particularly obstinate, Penfield advised bilateral trephination with mechanical rupture of the offending membranes.

In a series of 9 controls the effectiveness of barbiturates on the syndrome could not be proved—narcosis with sodium amytal proving unsatisfactory. Many patients had been receiving daily doses of luminal for various periods prior to admission with no improvement.

Brahdy (18) tried the effect of ergotamine tartrate on a series of 6 cases without improvement.

One of the effects of injecting hypertonic saline into the circulation is a diminution in the volume of the brain—hence it has been advocated for the relief of headache in post-contusional and post-concussional states. Feiling (19) found that even 100 ml. of 30 per cent. solution could be given, but usually 50 ml. of 15 per cent. was effective. Twelve controls in the present series showed no satisfactory response to this form of treatment.

At the General Hospital, Johannesburg, oral administration of prostigmine hydrobromide, 15 mg. *t.d.s.*, was given for 6–8 weeks, together with intramuscular injection of 1 c.c. of a solution of prostigmine methyl-sulphate, 1 in 2,000 twice weekly for 6–8 weeks, combined with a restricted fluid intake. Prostigmin helps the action of acetylcholine, which is a powerful vaso-dilator, and thus abolishes vaso-constriction of meningeal and labyrinthine arteries, which vaso-constriction is presumably the cause of persistent post-traumatic headaches (Malone, 15).

In view of the long duration of symptoms in the majority of cases it was felt that an expedient was necessary which would promote quick readjustment and reduce stay in Hospital to a minimum. Believing that in the majority of cases the disorder was on the basis of a disturbed vascular physiologic change, we decided to use the preparation Afenil, with which we had previously obtained very encouraging results in the treatment of the catatonic form of schizophrenia (20).

Afenil, or calcium chloride urea, is a preparation of calcium for intravenous administration. It is a double combination of one molecule of chloride of calcium (31.6 per cent.) and four molecules of carbamide (68.4 per cent.), prepared in ampoules, each containing 10 c.c. of a 10 per cent. solution = 0.11 gm. calcium. Given intravenously, if the technique be scrupulously attended to it is free from pain and risk, but special warning must be given of the risk of necrosis if there is any leakage into the intramuscular or subcutaneous tissues. Intravenous injection is performed in the customary manner with the aid of a compressor bandage; location of the needle in the lumen of the vein should be carefully ensured in order to prevent any of the injection fluid entering the perivascular tissue.

An instantaneous vaso-dilatation is produced, with access of heat to the head, accompanied by flushing, sensations of heat in the mouth and stomach, and slight cerebral pressure, the injection being carried out slowly. Variations

in blood pressure are of the slightest. Alterations in the urine were not seen, nor was there any noteworthy acceleration of the pulse beat during the injections. Given every second day the injections were always well tolerated. After each injection the patients lay down and relaxed completely for two to three hours.

All cases received a complete neurologic survey, including intelligence tests and psychiatric studies before and after treatment.

The following objective signs were taken in evaluating the amount of labyrinthine vertigo present: (1) Nystagmus after quick movements of the head; (2) spontaneous nystagmus with patient's head extended backward to the right and to the left; (3) ophthalmic examination.

RESULTS OF TREATMENT.

There was a subjective sensation of a lack of muscular tension with attendant relaxation shortly after the first injection. As a consequence of this lessened tension irritability decreased, fatigue disappeared and sleep became more normal. Conduct disturbances became much more modified, and, after a week or two of treatment, disappeared. By the fourth injection improvement was obvious and was maintained in all cases; the onset of headaches and giddiness had considerably diminished, and in many cases were reduced to rudiments, concentration improved and the patient's outlook altered appreciably. It was a noteworthy fact that patients who were at first distrustful or even antagonistic to the injections asked directly for a repetition because they said they found their effect quietening, beneficial and only pleasant.

By using this preparation a syndrome which had been established for varying lengths of time could be greatly diminished at an early stage of the treatment. On completion, this improvement was fully maintained in all cases; symptoms had disappeared, the outlook was bright and optimistic, morale and confidence were restored. Average duration of stay in hospital was 60.2 days, which is satisfactory in view of the severity of symptoms presented and the time which had elapsed in the majority of cases before treatment was started.

Appended are details of three typical cases. Each patient kept his own notes on progress:

CASE I.—Admitted 14.xi.44; discharged 19.i.45. Glider crash D day, 6.vi.44, with head injury and slight crash injury to spine.

Was unconscious for about eight hours. M.O. who first saw him saw C.S.F. coming from wound in L. temporo-parietal region. Had a faint recollection of being in a R.A.F. Station Hospital, and of afterwards being taken to Oxford. Complained of severe headaches, almost constant, L. temporal passing to occiput. Was very light-headed at times. Had frequent dizzy spells, everything swimming round him. Loss of concentration and loss of confidence. Head went "all queer if he went to a cinema or to a dance." Memory impaired. Was very irritable, moody and bad tempered.

Notes.

2nd injection: "The injections seem to make me restful and steady."

3rd injection: "Sleep good. Head clearer. Feel better."

5th injection: "Can enjoy things better. Feel much more easy with people and can now mix with the others and talk to them. Can concentrate a lot better."

7th injection: "Feeling 100 per cent. better. Finding much more pleasure in life. Can enjoy myself and feel I am going to recover. Temper much better."

12th injection: "Head and temper feel good. Am much more settled and can work hard all day now and get no dizzy spells at all. Am enjoying life."

13th injection: "Been home and now feel reasonable with everyone. I feel quite different."

CASE 2.—Admitted 31.x.44; discharged 12.i.45.

Complained of headaches, frontal, at times occipital, which came on many times daily, lasting 10–30 minutes; depression, irritability, dizzy attacks, especially on bending. Concentration impaired. Had lost memory on two occasions for short periods. History of two head injuries.

(1) January, 1942. Shell splinter hit L. occipital region; sustained cerebral contusion and fractured skull. Was unconscious until the following day, when he came to in hospital. Felt hazy and foggy—"things hard to recollect." In bed for five weeks. On getting up was unable to concentrate, felt irritable, had severe headaches and could not stand noises.

(2) March, 1943. R. malar bone damaged by shrapnel. Operation R. temporal area to repair same. Was unconscious on this occasion for five hours. Afterwards felt "all sense of what he was doing had been taken away from him." Had lapses of memory and forgot to carry out orders. On admission stated he had "lost interest in everything and had become resigned to headaches."

Notes.

"On admission I was feeling very depressed and suffering from severe headaches. I was very irritable and quarrelled all the time I was at home."

2nd injection: "After this I went to sleep and when I awoke I found that I felt better with my head easier."

4th injection: "I must admit that I am feeling more cheerful and am beginning to get my confidence back. Headaches have become much milder. Feel depression is going. I am not so jumpy."

6th injection: "I am feeling much fitter and quite lively and don't jump at every sound. I can concentrate now."

10th injection: "Am feeling much more confident and cheerful than I have done for a long time. There has been great improvement. Feeling much better all round."

12th injection: "When I go home I feel in a fine mood. Am feeling fitter than I have for a long time and much more happy. My memory is all right now."

CASE 3.—Admitted 13.vi.45; discharged 17.viii.45.

This patient was admitted from the general side of the hospital in a very serious mental condition. He was very agitated and depressed, had severe headaches, much irritability, bad temper, and nocturnal restlessness. Felt suicidal at times, that all hope was lost, that nothing could be done for him. He was unable to concentrate or think clearly; memory was much impaired for recent events. Stated his mind often "went blank for a long time." Thoughts were confused and "often mixed up at times." Had impulsive attacks of bad temper, with a tendency to violence. History of three head injuries.

(1) France, July, 1944: Fell down a German man-trap. Unconscious 1½ hours. In hospital for a month, where he developed headaches.

(2) September, 1944: When driving ammunition lorry explosion occurred which blinded him. Lorry went over a ditch; he struck his head. Was unconscious for seven hours and very hazy for days afterwards. Was in hospital for three months. Head was "driving him mad all the time." Boarded B1 on 3.iv.45. Returned U.K.

(3) May 24, 1945: Following quarrel with a soldier was knocked out and left unconscious on road. Was unconscious for several hours. Very confused afterwards and subsequently admitted to Sutton. This man's improvement was dramatic.

Notes.

2nd injection: "Fewer headaches and more confidence seem to be the effect these two injection have had on me."

4th injection: "I feel much better and more settled. Dizziness is passing off and headaches seem to be under control. The injections do me a lot of good; it is not a drugged feeling. Am a lot less depressed and bad tempered."

6th injection: "I now have a full night's sleep. Spend the mornings in the workshop and can now go to the pictures. Before these injections I could not bear the thought of anything like that. Now everything seems different, and I can enjoy myself with no ill-effects, such as headaches. No sway between moods as there was at first. Have much more confidence and seem to be getting back to my original self."

10th injection: "These injections have certainly made me feel very much better. I can concentrate and think clearly and now feel equal to anyone."

INTELLIGENCE TESTS.

Fifty-four of the cases (unselected) were given the 20-minute Progressive Matrices Test on admission and on completion of the treatment. Group mean scores and standard deviations for the two tests are as follows:

	First test.	Second test.
Mean scores	33.37	38.93
Mean percentile scores	(41.26)	(65.84)
Standard deviation	13.15	12.61

These figures show a substantial increase after treatment. By the following formula it is possible to calculate the significance of this increase without resource to controls:

$$\sigma_D = \sqrt{\sigma^2 M_1 + \sigma^2 M_2 - 2r_{12} \sigma M_1 \sigma M_2} \quad (20)$$

The critical ratio obtained from this formula is 5.55/1.45 or 3.82, and the probability that the obtained difference is significant is almost 100 chances in 100, i.e. virtual certainty.

Confirmation is demonstrated by a comparison—by grade—with 107 control cases tested on admission and after discharge on the same test.*

Gr.	I	Expected %	Control group. (107 cases.)		Treatment group. (54 cases.)	
			First test.	Second test.	First test.	Second test.
			%	%	%	%
	I	5	3	10	9	17
	II	20	14	15	18	28
	III	50	48	42	41	39
	IV	20	25	25	30	16
	V	5	10	8	2	0

	Control group. %	Treatment group. %
Two grades up	5.6	3.7
One grade up	25.2	37.1
Unchanged	53.4	55.5
Down one grade	14.9	3.7
Down two grades	0.9	0.0

* The cases used as control group were neurotics from a similar population. We are indebted to Mrs. H. T. Himmelweit of Mill Hill Emergency Hospital for the figures.

The treatment group also show less score deviation on retest—unlike the control group, which shows a slight increase. The coefficient of variation $\frac{100\sigma}{M}$ for the treatment group is 18 per cent. less on the second test than on the first test (32.43 against 39.38).

The improvement shown after the injections was evident not only in the enhanced speed and accuracy, but also in the men's demeanour, when they assembled for the retest: they were brighter and more cheerful.

DISCUSSION.

The results obtained from the use of Afenil for the relief of the distressing symptoms of the post-concussive syndrome help to throw a new light on the aetiology of the disorder.

The administration of the preparation produces a powerful vasodilatation of the organism, which supports Malone's (15) theory that the syndrome in part has as its aetiological basis an altered vasomotor activity. He put forward the hypothesis that in the relief of symptoms by prostigmine the ensuing vasodilatation acted on the labyrinthine and cranial blood vessels. Perlow (22) has found this dilatation to be primarily arterial rather than arteriolar or capillary.

Helfand (23) found in a series of 22 cases of the syndrome that many of the findings were of a functional (reversible) nature, and believes that they were primarily vasomotor in origin.

Zacks (8) has described degenerative changes in the nuclei of the cochlear and vestibular nerves, as well as an altered irritability of the vasodilators and vasoconstrictors, with resultant areas of localized altered circulation.

Wolff (24) concluded that intracranial pain is due to an alteration in the tonus of the involved arteries and of the meningeal arteries in particular. This goes to support the results obtained with Afenil. It is possible that such vasodilatation may result in the mechanical breaking-up of organic changes, such as adhesions.

Further to the vasodilatation produced one might ascribe to the calcium content of Afenil a checking influence on conditions of excitation of the nervous system. Calcium ions have a general sympathicotonic effect. The investigations of Jänsch on the eidetic constitution, and Peritz (25), who traces a part of the schizothymic dispositions of Bleuler and Kretschmer to spasmophile dynamics of the organism, suggests that calcium therapy acts by way of the epithelial bodies.

In reference to other calcium mobilization agents, notably those containing vitamins B and D, some of these latter medicaments were substituted with practically no result at all. Intravenous application is indicated in all cases.

The effect of Afenil on post-concussive states is unmistakeable, and its employment is to be recommended for its undoubtedly favourable effect upon the course of the cure. The results suggest that the symptoms of the post-concussive syndrome are probably produced through pathophysiologic

mechanisms involving an alteration in the vasomotor tonus with resultant muscular tension and vascular instability.

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ASYMMETRIES OF SENSORY FUNCTIONS (SPATIAL AND TEMPORAL DISCRIMINATION) IN NORMAL PERSONS.

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INTRODUCTION.

COMMENTING on the different symptoms produced by disturbances of the left hemisphere (aphasia, apraxia, etc.) and of the right (dreamy states, hallucinations, etc.), Hughlings Jackson on many occasions pointed out that there exists a "duality" of the brain; the anterior parts of the left hemisphere serving more controlled and objective* purposes, the posterior parts of the right more subjective† and the anterior parts of the right serving more automatic purposes. Consequently, quoting Bastian and Rosenthal to support him, he tendered the suggestion that "mental" symptoms might be indicative of a disturbance particularly of the posterior parts of the right hemisphere (in right-handed people).

The observations of later authors (Oppenheim, 1902; Cassirer, 1923), the discovery of anosognosia, the importance of a damaged right hemisphere in disorientation in place (e.g. recent papers of *Brain*, 1941; Paterson and Zangwill, 1944 and 1945), in time (Hoff and Pötzl, 1934 and 1937; Ehrenwald, 1931, 1932; Clenov and Eidinova, 1934; Paterson and Zangwill, 1945), in apraxia for dressing (*Brain*, 1941; Paterson and Zangwill, 1945), and in some mental syndromes of non-manic or non-depressive colouring (Fleischhacker, 1945), showed the ideas of Hughlings Jackson to be correct in principle so far as clinical-anatomical considerations based on deduction from pathological cases are concerned.

One has to be cautious in deducing from pathological conditions the "localization" of normal functions. We have, however, the right to assume, when damage to a part of the brain causes a disturbance of such and such a function, that the structure and physiology of this particular part must be of importance for the working of that function under normal conditions. The idea of hemispheric "dominance" is based on such reasoning. But we need not rely on deductions only. Hughlings Jackson referred in his paper on "The Nature of the Duality of the Brain" to observations of Gratiolet and Broca that the two hemispheres of the brain are asymmetrical, the left anterior and the right posterior parts being the larger respectively. In more recent years G. E. Smith (1927), Economo (1927) and his school have emphasized such asymmetries. Even microscopical differences between corresponding parts of the right and left halves of the brain have been described (Economo-Horn, 1930; Stengel, 1930; Betz and others, as quoted by Economo-Koskinas, 1925).

Marked asymmetries in form and size of lobes, gyri and also of deeper parts

* "Objective"—psychically corresponding to what is physically the reaction of the organism on the environment.

† "Subjective"—psychically corresponding to what is physically the effect of the environment on the organism (*Selected Writings*, Vol. I, p. 310, from *Brain*, 3, 192, 1880).

of the brain (e.g. thalamus, striate bodies, cerebellum, oblongata) have been confirmed by the author's observations (unpublished).

As far as physiological differences go, electro-encephalographic asymmetries have been described by F. A. Gibbs (1942), Williams and Reynolt (1945) and particularly by Mrs. M. Gibb (1945) (as quoted by D. Hill). In some normals reflex disturbances can be produced under certain conditions and are found to occur more often on the left side (Fleischhacker, 1943).

The pathological and normal findings, together with the existence of handedness and eyedness, invite further studies in the field of cerebro-peripheral organization of laterality or asymmetry of function. Such investigations might also make a contribution to the problem of how central and peripheral conditions are correlated and interdependent.

In connection with tentative suggestions put forward in a previous paper (Fleischhacker, 1945) two sensory functions have been selected for the present investigations :

1. Spatial (tactile) discrimination of two points on the thumbs as connected with the more technical-practical experience of recognizing and handling individual objects (possibly better developed on the left hemisphere).

2. Aural discrimination of the speed of time signals as connected with functions forming the basis of experiences of a more distant and, at the same time, more subjective nature, not directly within our grasp (and possibly better developed on the right hemisphere). Vierordt's statement (1868) that the ear is the best sense for the "estimation" of time has recently been confirmed again by Goodfellow (1934).

Before describing the investigations carried out and results obtained it might be worth while to point out—

(A) That overt right-handedness is either innate (structural, anatomical), or acquired (functional), and superimposed on latent, innate, non-right-handedness. This latter is much more frequent than previously thought so that, while about 95 per cent. or more of the population are overtly right-handed, only 75 per cent.—and most likely less—are structurally right-handed or dextralateral.

(B) That in the present investigation we shall examine functions more based on innate structure than on acquired abilities. Therefore it is to be expected that the persons examined will be—

- (i) Such as are anatomical and functional right-handers (or dextralaterals), and—

- (ii) Such as are not. These then might be—

- (a) Anatomical sinistrolaterals but functional right-handers, or

- (b) Anatomical and functional sinistrolaterals, and also

- (c) A mixed group of so-called ambidextrous or ambilateral persons.

I. ASYMMETRIES OF SPATIAL DISCRIMINATION.

Material and Technique.

Twenty-five persons have been subjected to over 3,500 testings. On 20 of them mainly aesthesiometric tests have been carried out ; but four of these and five others have been subjected to other tests, which will be mentioned

later. Their ages ranged from 12 to 67, 14 were males and 11 females. Professionally they were nurses, laboratory technicians, office workers, medical students, doctors and a schoolgirl. Two aesthesiometers were used (Head's and Carroll's). The results were approximately the same.

With a few exceptions the tests were carried out on the skin over the wrists, the radial parts of the metacarpus and the radial parts of the first phalanx of the thumbs. It is necessary to test spots which are as "symmetrical" as possible on the right and on the left. In practice, considerable difficulties are encountered, as the hands are not quite symmetrical. Apart from the anatomical position of the spots examined, growth of hair, thickness of the skin, creases, etc., have to be considered. It is also of importance that the skin should be clean. Two kinds of error will occur when the two points of the aesthesiometer are applied close together:

(a) The two touches are felt as one.

(b) Paraesthesias and even illusions occur so that one touch is reported as two. Therefore results should be registered separately according to whether one or two touches have been administered. It has also been found useful to register "doubtfuls," and the testees have always been encouraged to give a "doubtful" and not to guess when they could not come to a decision. The experiments were carried out in the following way:

The testee was sitting at his ease with both hands placed on a table. The axis between the points of the aesthesiometer runs parallel to the axis of the limb tested. If both points were applied, they were applied at the same time, i.e. together and not one after the other. The length of time of the touch of the skin was one to two seconds. As a rule the wrists were tested first, then the metacarpus and thereafter the basal phalanx of the thumbs. In a few cases the wrists have not been tested and in two others the wrists only. In these last two cases the examination had been interrupted and, on resuming it the following day, it occurred that the testees had found out that differences between left and right were expected.

At first a few preliminary tests were given with the two ends of the instrument close or less close together in order to provide the testee with an idea of the examination. At the same time the examiner had a chance to find closely corresponding areas on the right and on the left. Then the testee was asked to close his eyes and the experiment proper started with a series of four tests, each on the right and on the left. In each such series two single and two double touches were applied while the distance of the two points remained the same but the order of touch within the different series was changed. It was found desirable to begin with such a distance of the two aesthesiometer points that all four answers were definitely positive on either side and this series of four tests was repeated. Then the two points were brought a little closer together and another series of four tests on each hand was given. This procedure was carried on until at least half of the answers in one series was wrong. This series was repeated at least once. On repetition, in a small number of cases, more right answers were given, and then the experiment went on until on both hands half of the answers were wrong. It sometimes proved useful to go a step back and to widen the distance again in order to get positive results.

It is known that the distance between the asesthesiometer points, still allowing discrimination, varies considerably with the parts of the body and the individual tested. Accordingly, the number of tests carried out on different individuals in order to obtain reliable results varied considerably. On the average 150 to 200 tests were required for each person, but in one case only 86 and in another 360 had to be carried out.

Results.

In the following tables the results are given for wrists and thumbs separately (but those obtained on the metacarpus and basal phalanx of the thumbs have been added together, as there was no essential difference between the two). There was one group of right-handed and one group of non-right-handed persons.

TESTS ON SPATIAL DISCRIMINATION.

TABLE I.—*Results of Aesthesiometer Tests.*

A. Right-handers.

Name.	Wrists.						Thumbs.					
	R.			L.			R.			L.		
	+	-	?	+	-	?	+	-	?	+	-	?
Miss Mi—	5	10	5	15	3	2	80	18	2	73	25	2
Miss Sm—	11	6	3	16	4	0	120	33	7	118	41	1
												(digs also with left)
Dr. (Miss) S—	10	7	3	14	6	0	69	10	1	52	23	5
Mr. La—	7	11	2	12	6	2	54	14	0	46	21	1
Mr. Bi—	13	6	1	11	6	3	65	13	5	60	22	2
Mr. Co—	17	10	5	23	4	5	30	8	2	17	6	7
Mrs. Ho—	17	5	10	24	6	2	60	8	4	55	8	9
Miss McM—	28	10	9	29	8	10	19	6	7	18	11	3
												(injects also with left)
Mr. J—	12	7	1	4	4	12	28	2	6	18	8	10
Mrs. F—	..	..	..	..	..	..	42	18	0	27	33	0
Miss I—	..	..	..	..	..	..	48	15	9	38	26	8
Dr. F—	..	..	..	..	..	..	60	16	12	52	28	8
Miss F—	..	..	..	..	..	..	43	17	0	28	32	0
Miss C—	6	5	9	10	7	3	Test was interrupted. On resumption it was found that Miss C. had got information of which results were expected.					

Sa. . . 126 77 48 158 54 39 . . . 718 168 54 590 294 56

B. Non-right-handers.

Name.	Wrists.						Thumbs.					
	R.			L.			R.			L.		
	+	-	?	+	-	?	+	-	?	+	-	?
Mr. H—	7	2	7	8	2	6	17	13	2	14	11	7
Mr. G—	15	10	11	31	1	4	50	8	10	49	10	9
Miss Co—	23	4	1	16	9	3	55	22	3	61	19	0
Mr. W—	8	5	11	8	8	8	(Not continued for reasons as Table I, A, Miss C—.)					
Mr. C—	19	7	2	15	12	1	32	16	0	38	10	0
Mr. Ge—	13	6	1	11	6	3	21	13	2	20	12	4
Mr. Gr—	23	12	5	21	16	3	12	13	7	17	10	5
Sa. . .	106	46	40	108	54	30	187	95	24	199	72	25

Right = + ; wrong = - ; doubtful = ?.

In another small series of experiments on four persons the aesthesiometer was replaced by the somewhat cruder method of recognizing small figures like triangles, squares and circles on the forearms. The results were as follows :

TABLE II.—*Results of Differentiating Triangles, Circles and Squares "Written" on Forearm of Four Right-handed normal Persons.*

R.				L.		
+	-	?		+	-	?
47	17	16	.	39	24	17

In other experiments of a more sensory-motor nature, five persons were asked to close their eyes, to put thumb and forefinger of one hand into any position they liked and to imitate this with the other hand while their eyes remained closed. The results were as follows :

TABLE III.—*Results of Imitating the Posture of Fingers of one Hand with the Finger of the Other. (Five Right-handed normal Persons.)*

Imitation of right hand with left.			Imitation of left hand with right.	
+	-		+	-
29	64	.	48	45
Right = + ; wrong = -.				

In a last series a number of persons were asked to close their eyes, to put all the fingers of one hand into any position they liked, to try to get a visual idea of this position, and then to open their eyes and state whether this position corresponded to the one they had imagined. It was found usually that it comparatively rarely did. But two persons found it easier to get visual ideas derived from the position of the left hand than from the right hand, and on the whole, results from the left hand were better.

Discussion.

When one evaluates the results of the present investigation and compares differences obtained between the right and left, not only the positive, but still more the negative results should be considered. Actually, the negative results are of greater importance than the positive ones, as some of these might be wrong positives, for (see technique) not only might two touches be felt as one only, but also sometimes one touch is felt as two when the two points of the aesthesiometer are brought close together and the testee becomes a little tired.

Tables I to III show that in righthanded persons the functions tested are better with the right side, while it is the opposite in the non-right-handed group. The only exceptions are the results obtained over the wrists. Here the differences are less outspoken, there is even a possibility that they are in contradiction to the results achieved on the thumbs.

All persons tested said at first that they were right-handed. Only on closer questioning six of Group IB admitted that they performed a number of activities better with their left hand—such as digging, playing tennis, golf, cards

and so on. Two others belonging to IA were Miss McM—, who said she could give injections with the left hand, and Dr. S—, who said she could dig with her left hand. The persons mentioned in Tables II and III were apparently all right-handed. The subject of handedness will be discussed to some fuller extent later on.

It was already known to Fechner (1860) that the right and left hand have different sensibility.

That spatial discrimination on the skin is better on the "dominant" hand has been described long ago by Lombroso (1897), Féré (1896) and, above all, by van Bierlivet (1897). Bierlivet has investigated muscular sensibility, vision, hearing and spatial discrimination in 120 persons and altogether 8,600 investigations have been carried out on them. He came to the conclusion that in about 78 per cent. of the persons examined, the sensibility for vision, hearing and spatial discrimination was better by 11 per cent. on the right side, and in the other 22 per cent. on the left, although only 2 per cent. of them admitted that they were left-handed. These results agree roughly with the "positives" obtained on the right-handed group in the present investigation. The non-right-handed group is too small to allow of a more quantitative evaluation, being in all probability a mixture of left and both-handed persons. However, after having read Bierlivet's paper and found my results confirmed in principle, I have not pursued the subject of tactile discrimination any further.

But possibly the superiority of the right or "dominant" hand does not hold good for all sensory functions. According to Goldstein (1927), the threshold for pain is lower on the left side of the body, and Wile (1934, p. 111) quotes Dwight as saying that the right hemisphere distinguishes more readily between different degrees of temperature and weight. Bauer (1911) also thinks that the left hand is better in estimating weights. In connection with this I should like to refer briefly to experiments carried on internal visual images of posture. Superficially these experiments seem very similar to those on imitating posture from one hand to the other (Table III). They are, however, of a different nature, in that the task here was to form an internal visual image derived from a postural sense impression. This is not a "technical practical function" as all the others tested, but a more subjective one, "not directly within our grasp," although concerning the organ of grasp—the hand. If one may be allowed to comment on the results of about 100 tests carried out on five right-handed persons, two points emerge, the one more, the other less distinct. With regard to the former, each of these five persons was surprised how difficult it was to visualize internally the posture of their own hands and fingers, and how comparatively seldom internal and external visual images would satisfactorily agree with each other. This supports the view of those who think that the body scheme is not necessarily visual. With regard to the latter less distinct point, it appears that in the five persons tested a better internal visual image was formed from postural sensations arising from the left hand. At least two of these persons thought that it was easier for them to obtain a visual image from their left hand than from their right. That anosognosia is usually produced by lesions of the right parietal lobe does, to say the least, not contradict these results. But such experiments will have to be

carried out on a larger number of persons, right and left-handed, and of different sensory types before any conclusions can be drawn.

2. ASYMMETRIES OF TEMPORAL DISCRIMINATION (AURAL DISCRIMINATION OF TIME INTERVALS.)

Material.

In the following experiments temporal discrimination was stimulated and estimated aurally by comparing slightly different time intervals produced by the beats of a metronome. As the discrimination of very small variations of time intervals was extremely difficult if only one single interval was to be compared with another of different (or same) duration, identical time intervals have to be repeated several times in sets or sequences for comparison. These sequences of shorter or longer time intervals are experienced as "faster" or "slower." Over 1,000 tests have been carried out on 40 persons. There were 20 males and 20 females. Their ages were between 13 and 68 and their occupations were more or less the same as in the experiments on spatial discrimination.

Technique of Metronome Test.

The instrument used was an ordinary metronome, and irregularity in speed, if any, was less than 2 per cent. per minute. The instrument was checked repeatedly in this respect. The variations were from faster to slower and from slower to faster speeds. Usually the number of tests with the variation to a faster speed was slightly greater than the other. Most of the experiments were carried out with time-signals between 84 and 96 beats per minute. The differences given for comparison were four beats per minute. In a number of experiments, however, the speed was between 144 and 168 beats per minute with variations of eight beats per minute; the results did not differ from those obtained with the slower speed. With binaural tests, in such circumstances, correct differentiation is possible in 80 to 90 per cent. of the tests (Vierordt). It usually took about three seconds to vary the speed of the metronome from one setting to the other. Such an interval was also allowed to pass in a small series of other experiments in which the speed given for comparison was not changed. It is known from binaural tests that in such circumstances only 20 to 30 per cent. of correct answers (namely, "no change") can be expected. The experiments should be carried out in a quiet room, as outside noises are disturbing and interfere with results. The testee should be seated at his ease in order to be in the right poise of "relaxed concentration." He should firmly close one ear with his hand and turn the other towards the metronome placed five or six yards away. The eyes should be closed so that he cannot see the swing of the instrument's pendulum.

In the actual experiment a preliminary gross demonstration was given to the testee. The metronome was allowed to beat at a medium speed for eight or twelve times.* Then, for comparison, the speed of the beats was changed by about twelve/minute, and the testee was asked to state the change. Then

* This was the average number of signals it took most persons for "remembering the time." But there are variations from one individual to the other, and it is the best to ask the testee to make a sign when he has "got" it.

the instrument was allowed to beat again, and after eight to twelve beats the speed of the metronome was altered, but in the other direction and the testee was again asked to state whether and what difference he noticed. He was informed that in the actual tests the variations would be definitely smaller but that, nevertheless, most of his answers should be correct, the possible answers being "faster," "slower," "no change" or "doubtful."

Now a series of tests in pairs (first one speed and then another for comparison), usually consisting of ten such pairs, was presented to one ear and then an identical series to the other. After a few investigations it appeared that, in anatomically right-handed persons, temporal discrimination was better on the left, in agreement with the expectation. Consequently, in order to make discrimination more difficult for the left ear, as the testee often got a little tired and nervous towards the end of the experiments and the influence of practice could be discounted, the right ear was usually tested first. The arrangement is of no decisive importance, as can be seen from the results obtained on non-right-handed persons, most of whom stated at first they were right-handed, so that their better ear was tested first.

In order to avoid bias it was made sure that the testees knew nothing of the eventual aim of the investigation, or of the results obtained on others. In order to exclude bias on my side I asked before the experiment started whether the testee believed himself to be right or left-handed, being content with this reply until the metronome test was over. Only then were tests on handedness carried out. The knowledge of the testee's handedness or laterality is necessary for the understanding of the results.

Tests on Handedness.

An appropriate idea of a person's structural original, innate, anatomical (also subcortical?) laterality has to be ascertained by tests rather than by questioning which hand is preferred for different activities. There is an exception, namely, the hand or arm used for carrying small things like books, handbags, small parcels, overcoats and so on; this is usually the left in right-handed people, and my own observations are in agreement with those of Wile and Régnault. A person with only acquired functional (mainly cortical?) right-handedness will very often betray himself by using the right, or either, upper limb for such purposes. A reliable test for handedness is to watch the person's relaxed hands when he stands, or, better still, walks. The hand of structural handedness is slightly more closed in such circumstances than the other, even if this latter hand is the hand of functional handedness. Another test is a slight modification of one described by Loeb (1887); the person stands at his ease before a not too low table or desk. A point opposite the midline of his body is marked on the table and the testee is asked to touch lightly the edge of the table with the forefinger above and the thumb below on either side of the mark. He then closes his eyes and is requested to move both his hands together with the same medium speed aside, away from the marked point and always with the edge of the table between his fingers until he is asked to stop. The distance between his hands and the starting point is usually longer on the side of structural handedness, although, according to Cremer, as quoted by

Results.

Tables IV-VI: Aural discrimination of time intervals.

TABLE IV.—"Right-handers."

Name.	Metronome.		L. ear.	Same.	?	R. ear.		Hand more closed.	Loob.	Aesthesiometer.	Better ear.	Small parcels carried.
						+	- Same. ?					
Mrs. F—	27	3	11	1		19	11 8 4	1	r > 1*	r > 1	r	r (+ 1)
Dr. F—	24	4	3	..		17	8 6 ..	1	r > 1	r > 1	r	r
Miss F—	6	1	..	..		4	2 .. 1	1	r > 1	r > 1	r	r (+ 1)
Mr. Wil—	8	..	2	1		6	2 2 3 ..	1	r > 1	—†	r	1
Mr. Lv—	10	..	..	1		7	2 .. 1	1	r > 1	..	r	1
Mr. Lb—	9	..	..	1		7	1 .. 2	1	r > 1	r > 1	r	1
Mr. Ki—	9	1	..	..		7	1 .. 8 1	1	r > 1?	..	r	1
Mrs. O—	8	1	1	..		6	.. 4 ..	1	r > 1	..	r	1
Miss I—	9	..	..	1		8	1 1 ..	r > 1?	r > 1	..	r	1
Miss By—	8	1	1	..		6	3 1 ..	1	r > 1	r > 1	r = 1	1
Miss Sh—	7	3	..	..		5	5 ..	1	r > 1	r > 1	r	1
Miss McM—	10	..	..	2		8	2 .. 3	r = 1?	r > 1	..	r = 1?	1†
Miss Sa—	7	1	..	..		5	2 .. 3	1	r > 1	..	1	1
Mr. Coo—	7	1	..	..		4	1 3 ..	1	r > 1	..	1	1
Mr. Ch—	4	..	3	..		5	2 ..	1	r > 1	..	1	1
Miss Wi—	9	1	..	..		8	1 1 ..	1	r > 1	r > 1	r = 1	1
Dr. H—	9	..	2	..		7	.. 3 1	1	r > 1	..	r = 1	1
Miss Ke—	7	..	3	..		7	2 .. 1	1	r > 1	..	r	1
Mr. Gl—	8	..	1	..		7	1 1 ..	1	r > 1	..	1	1
Mrs. H—	6	4	..	..		5	5 ..	—	r > 1	r > 1	1	r + 1
Mr. L—§	13	2	..	..		12	2 .. 1	r > 1?	r > 1	r > 1	r	—
Miss Mi—	12	1	4	..		11	1 5 ..	1	r = 1	r > 1	r = 1	1
Mr. J—	6	2	2	..		5	1 2 2	—	—	r > 1	r = 1	?
Sa.	223	26	33	6		177	56 38 17					

* r > 1 = r better than 1.

† — = test not carried out.

‡ Tube catarrh r.

§ Tried to beat time 1.

|| Broke right arm 12 years ago, thinks he might be ambidextrous.

Right = +; wrong = —; no difference = same; doubtful = ?.

TABLE V.—“Ambidextrous.”

Name.	Metronome.		Hand more closed.	Loeb.	Aesthesio-meter.	Better ear.	Small parcels carried.
	L. ear.	R. ear.					
	+ — Same. ?	+ — Same. ?					
Dr. M—†	6 1	5 .. 1 1	—†	r = 1	r = 1	r	—
Dr. G—	6 1 3 ..	6 1 2 1	1	1 > r	—†	1 = r	1
Dr. W—	6 2 3 ..	5 1 3 ..	1	1 = r	—	1 = r	1 + r
Mr. La—	5 4	5 4	1?	1 > r	—	1 = r	1 + r
Miss P—§	8 2 1	8 3	r	1 > r	r = 1	1	r
Miss H—	7 2 1 ..	7 1 2 ..	r	1 = r	1 = r	r	1
Mr. P—	7 1 2 ..	7 2 .. 1	1 = r	r > 1*	—	r	r
Miss T—¶	7 1 .. 2	8 2	1	r > 1	r > 1	r	1

Sa.

§ Always ambidexter.

* r > 1 = r better than 1.

† — = test not carried out.

‡ Ambidexter; old otitis l.

¶ Right = +; wrong = —; no difference = same; doubtful = ?.

TABLE VI.—“Left-handers.”

Name.	Metronome.		Hand more closed.	Loeb.	Aesthesio-meter.	Better ear.	Small parcels carried.
	L. ear.	R. ear.					
	+ — Same. ?	+ — Same. ?					
Mr. P—	9 2 .. 1	11 1	1	1 > r	1 > r	1	1
Miss F—	5 2 5 ..	8 1 2 1	r?	1 > r	1 > r	1	r + 1
Miss M—†	3 3	6 1	—*	—	1 > r	1	—
Mr. W—	3 1 3 ..	6 1	1	1 > r	1 > r	1	r
Mr. G—	6 2 1 1	8 .. 1 1	1	1 > r	1 = r	1	r
Mr. M—	5 2 3 ..	7 1 2 ..	1	1 > r	1 > r	?	1
Mr. P—	9 1	10 1	1	1 = r	1 > r	1 = r	1 + r
Mr. K—	5 .. 4 1	8 2	1	1 = r	1 *	1 = r	1 + r
Miss D—	6 1 2 1	8 .. 2 ..	r = 1	1 > r	—	1	1

51 14 18 4 72 3 9 3

* — = test not carried out.

† Left hand longer, stronger, finer finger-movements 1 > r.

¶ Right = +; wrong = —; no difference = same; doubtful = ?.

Loeb, the outcome of this test may be influenced by the testee's occupation. This test is described in the tables as "Loeb."

The acuity of hearing was tested with a wrist-watch; and on a number of persons the aesthesiometer was used. According to the outcome of the tests together the testees have been tentatively subdivided into the three groups of dextrolaterals (Table IV), ambilaterals (Table V), and sinistrolaterals (Table VI).

In Table VII the errors (excluding "doubtfuls" and false "no changes") have been set out. The table has been subdivided into:

(a) Absolute errors, "faster" instead of "slower" and vice versa from all the tests together where such differences have been put down in detail (Table VII, A); and

(b) Non-absolute errors from 82 pairs of tests (most of them obtained on four persons), when the time was not changed, and the wrong answers were "faster" or "slower" instead of "no change."*

TABLE VII.—Errors; All calculated as if Right-handed.

A. Absolute errors (answers "slower" instead of "faster," and vice versa).

R. ear.		L. ear.	
"Slower."	"Faster."	"Slower."	"Faster."
41	33	24	15

B. Non-absolute errors ("faster" or "slower" instead of "no change.")*

R. ear.		L. ear.	
"Slower."	"Faster."	"Slower."	"Faster."
31	24	33	14

Sa. . . 72 . 57 . 57 . 29

* The other answers given in this test: + R. L.
(Right ("no change") = + . . ? 22 . 23
doubtful = ? 5 . 12

Discussion.

Before discussing the results of this investigation the question of laterality has to be dealt with. It is certain that structural (anatomic) or innate non-dextrolaterality occurs more frequently than previously assumed. Bierlivet concludes that anatomical left-handedness was at least as high as 22 per cent.* Bauer's figures* show only 60 per cent. right-handedness, the rest being left-handed or ambidexter, but in his conclusions he does not differ much from Bierlivet. Tests carried out on eyedness (Johnston, 1941; Parson, 1924; Seltzer, 1934)† show that only 70 per cent. or even considerably less of the population is anatomically right-eyed. The figures obtained by Stern* and Haak* agree with these claims. It should be mentioned, however, that the figures vary even for the laterality of the same organ when different techniques

* In European continentals.

† In the U.S.A.

are applied (Wile, Johnston). Apart from this, some authors (Johnston, Seltzer) think that a person might be more or less strongly right or left lateral or even mixed lateral (Orton, 1927; Wile; Stern, 1933). It is therefore necessary to apply a battery of tests in order to get a true idea of a person's laterality (Seltzer). Considering that the number of persons* tested in the present investigation is very small, that different tests have been applied to different organs and that the tests in themselves were not of a very elaborate nature (this may account particularly for the comparatively large group of ambilaterals†), it will be seen that a comparison with the results obtained on the laterality of much larger populations is satisfactory.

The tables show that there was one group of persons who discriminated differences in time intervals given by the metronome better with the left ear and that this group was essentially right-handed. In another group discrimination was not much different with either ear: this group was essentially ambilateral. In the last group the results obtained were best with the right ear, this group consisted essentially of anatomically left-handed persons. In this last group the differences between right and left were particularly striking. This might be entirely incidental, as the group was very small. On the other hand, it was anatomically very markedly sinistro-lateral, and also experimental conditions were most favourable for the right ear, which was tested first, as nearly all testees said before the experiment started they were right-handed, and only later some of them admitted to having been left-handed when young or to be ambidextrous now.

The results are apparently primarily independent of the acuity of hearing as tested by the wrist-watch. On the contrary, aural discrimination of time may be better with the ear which hears less acutely. Again, this is not always the case, and more accurate examinations will have to be carried out in order to decide whether there is any correlation, positive or negative, and whether and to what degree differences are due to peripheral or central conditions. The observations of Young (1926) and Knudsen (1922, as quoted by Young) that the left ear is better in the discrimination of differences of pitch may be relevant in this respect.

It is known (e.g. Vierordt; Myers, 1931) when short time intervals are estimated that there is a slight tendency to over-estimate (confirmed by Table VII) and therefore a number of "slower" obtained as positive may have been only right guesses. So that again, when differences between the two ears are evaluated, the number of errors give a truer picture than the number of positive results alone.

It might be of importance in this respect to note that the number of such over-estimates was comparatively high with the "dominant" left ear (especially in the group of non-absolute errors), while the number of under-estimates ("faster" instead of "slower") was low in both groups. In bi-manual estimation of weights, and also in Loeb's experiments the so-called inferior arm has similar tendencies (of over-estimating) so that there might be a con-

* Of English, Irish, continental origin.

† But Stern in his tests on eyedness has found a fairly large number of ambilaterals, so has Beeley (as quoted by Seltzer) in his measurements of arms and, from Bauer's experiments, the number of possible ambilaterals is fairly considerable.

nection in this respect, and further investigations into this point should be of interest. It may also help to clear the question of as to whether the right hemisphere (in dextro-laterals) is only of more "quantitative" importance with regard to discrimination of aurally given time-signals, and consequently aural experience and estimation of time, or whether it has a sense of time which in circumstances, at least, might differ from that of the other hemisphere.

It seems to be surprising that there should be not only a laterality of temporal (aural) discrimination, but that just that system should be more efficient which is usually considered as laterally "inferior" (l. ear $\rightleftharpoons$ r. hemisphere in right-handed persons). However, it will be remembered from examples given in the introduction that a number of disturbances of a more "mental" nature are produced by damage to the posterior parts of the right hemisphere, and that therefore for such functions the right hemisphere should be more "dominant." Paterson and Zangwill (1945) have recently also doubted the omnipotence of the left hemisphere with respect to dominance. Let us review what we know about the laterality of essentially sensory functions in normals.

There appears to be little doubt that acuity of seeing, hearing, and spatial discrimination is better on the "dominant" side. The same claim has been made for eyedness. The position here is, however, not quite clear. Eyedness, and according to G. E. Smith (1927) to a certain extent even acuity of seeing, is very dependent on the co-ordination of eye movements and in this respect belongs to the group of technical-practical functions. On the other hand, in the ordinary tests on eyedness the suppressed picture lies in the "dominant" visual field of binocular vision. It has still to be decided which function is to be considered as "dominant": that which allows the focused picture to be seen in the "non-dominant" field, or that which suppresses the other less well focused picture in the "dominant" visual field. Stern tried to solve this problem by stimulating corresponding points of the temporal parts of the retinae and came to the conclusion that in 15 per cent. of the 86 persons tested the right hemisphere, in 35 per cent. the left hemisphere and in 50 per cent. both hemispheres were "dominant" for seeing. But as far as I can see his technique was at least partially dependent on visual acuity, and I cannot find any reference that he has taken this factor into account.

The position is apparently equally undecided with regard to sensation of temperature. A diagram in v. Frey and Reiss's (1927) article shows that the points for "warm" are more numerous on the right side of the face. But according to Dwight (as quoted by Wile) the right cerebral hemisphere is more sensitive in differentiating between degrees of temperature.

Dwight and Bauer claim that the "non-dominant" system is better in estimating weights and, similarly, movements, as in Loeb's experiments. In a number of Fechner's experiments on himself (F— was obviously right-handed) the left hand or arm was better in comparative estimation of weights. But in other experiments with heavier weights the right hand or arm was better; here, however, fatigue may have come in. So the position is not quite clear either; although the possibility of a predominance of the "non-dominant" system cannot be completely rejected.

I would not mention the few experiments carried out on visual imagination

derived at from postural stimuli in which the "non-dominant" hand apparently gave rise to slightly better results, had I not come across a paper by Rowe and Washbourne (1908) on the "motor memory of the left hand." The authors found, to their surprise, that in 7 out of 8 persons tested the left hand was better. According to the authors, the explanation is simple—the better skilled right hand found it easier to perform the task and did it more automatically, but with the unskilled left hand more attention had to be focused on it—therefore the better results. Goldstein thinks that the level for pain is lower on the left. Some of Zigler, More and Wilson's (1934) experiments support this view.

The possibility cannot be excluded that the "non-dominant" hand might be "dominant" for some sensory functions. It is interesting that all such functions are either of a more subjective or mental nature (pain, visual imagination, motor memory) or connected with proprioceptive rather than exteroceptive nervous mechanisms (estimation of weights). There are also "motor" functions in which the left hand is "leading," e.g. defence in fight, carrying and holding small things, or the expressive movements of a conductor of an orchestra. These movements cannot be regarded only as complementary to the more technical-practical activities of the right hand, but are obviously of a more "subjective" character.

Thus the results of the present experiments on temporal discrimination are in agreement with the ideas outlined in the introduction, with the facts just mentioned, and also with recent clinical and pathological findings (Clenov and Eidinova, Cohen and Roechlin, Ehrenwald, Hoff and Poetzl, Paterson and Zangwill).*

It is not intended to make any further comment or speculation at this stage. But it might be well to remind the reader that the posterior part of the "non-dominant" hemisphere is larger, and possibly of a more complicated gross anatomical build than the corresponding part of the other hemisphere. One might, therefore, suggest that this larger part is more representative of the *very* complex temporal functions which are so often disturbed in psychotic conditions (Halberstadt, 1922; Lewis, 1932; Schilder, 1936).

SUMMARY AND CONCLUSIONS.

(1) Spatial discrimination has been examined in 25 normal persons. In 18 of them it was better on the right hand. The other 7 persons admitted left-handedness or ambidextrous tendencies.

* Their findings are confirmed by fairly frequent observations of my own. This is a short but typical example: E. C. U—, aged 39, aneurysm of aorta; aged 53, dysentery; aged 70, stroke—since then "confused and deluded." One year later (1939) admitted to Shenley. B.P. 220/120, tremor of left hand. No idea of time and place, she is in China or on board of a ship, the year is 1896, her age 60. Misidentifies persons, wanders about and gets lost. Thinks she is menstruating and frequently asks for sanitary towels. Otherwise no great intellectual loss; always cheerful and pleasant; no trouble. Aged 74: Becomes incontinent, speech slurred, slight right facial weakness? Two months later: Semi-comatose, broncho-pneumonia, tongue deviates to the left. Improves for a short while, but soon rapidly deteriorates and dies five weeks later. Post-mortem findings on brain: Softening of cortex, subcortex and deep white matter of right gyrus supramarginalis and angularis. Occipital lobe apparently not affected. Small cystic softening of upper edge of left putamen, several lacunae in right lenticular nucleus. The misidentification of persons and the feeling of menstruating, besides the spatial and temporal disorientation are of particular interest. Cohen and Rochlin's clinical case showed also disturbance of the "bodyself" together with temporal disorientation.

(2) Aural discrimination of time was tested separately on each ear, in 40 normal persons. There were three groups:

(a) Essentially anatomical dextero-laterals (23), with temporal discrimination better through the left ear.

(b) Essentially anatomically sinistro-laterals (9), with temporal discrimination better through the right ear.

(c) Most likely ambilaterals (8), with no outspoken differences between right and left.

(3) Clinical, pathological and physiological experiences show that the left hemisphere in right-handed persons cannot be considered any longer as "dominant" for *all* nervous functions, and if we speak of hemispheric dominance we have to specify the function concerned.

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* But apparently a misprint; not in *Phys. Rev.*—H. H. F.

CONTRA-INDICATIONS FOR LEUCOTOMY: WHOM NOT TO LEUCOTOMIZE.

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Now that more than six years have elapsed since the introduction of leucotomy in this country, it is becoming possible to assess more accurately its remoter effects. The increasing use that is being made of the operation bears witness to the beneficial results that have been obtained by it, but the justifiable enthusiasm occasioned by the dramatic improvements it has produced in some cases apparently resistant to all other present-day methods of treatment must be tempered by a sober consideration of all the sequelae of section of the prefrontal fibres. While it is undoubted that after it many cases are sufficiently recovered to resume a full and satisfactory social life, and an even larger number are either freed from intense misery or from hostility and aggressive impulses and enabled to take a more co-operative part in the sheltered life of a hospital community, there are a few whose behaviour following the operation is definitely less satisfactory than it was even at the height of their illness. Furthermore, even in the successful cases, certain undesirable traits have often been noted.

It is not proposed to deal in this paper with all the contra-indications for leucotomy, but to draw attention to a few cases, operated on at the Burden Neurological Institute, in whom the undesirable results are so pronounced that it is felt it would have been better had these patients not been operated on. It is hoped that this preliminary study will be followed by reports from other observers on the patients in whom the results are unsatisfactory.

An attempt is made, however, to discover if possible some common factor or factors in these cases which may be of general validity, and so capable of being used as a yard-stick whereby to judge of the advisability of leucotomy in any given patient. For this reason also these unsatisfactory cases are compared with some that are considered as being most successful, since it is thought that the contrast may help to throw into relief those pre-operative factors which most clearly distinguish the one type from the other.

Owing to the fact that the most outstanding changes which result from the operation are changes in personality, rather than in intellect, the reports on these patients must necessarily take the form of personal histories, but these have been made as brief as possible, and only include those features which are considered relevant to the point at issue.

Although most observers are agreed that the results obtained in the obsessional neuroses and depressive states are generally better than those in schizophrenia, it is noteworthy that the unsatisfactory cases reported here include

two neurotics, an anxiety and an obsessional case, and one schizophrenic. The undesirability of the post-operative personality seems much more definitely allied to the character of the patient prior to his illness than to the form of illness to which he succumbed. In these cases the patients' character undeniably contained unpleasant or anti-social traits, which after operation became even more evident.

It is reported of W. W—, who was leucotomized in September, 1943, aged 27, that she was always asocial, and although a member of a large family, being the second of 6 children, was different from the others. She was dependently attached to her very indulgent mother, but extremely jealous and determined to have her own way, intensely self-centred, and with many neurotic traits, such as fear of sleeping alone and nail-biting. She did not make friends at school, but is said to have enjoyed practical jokes of a mean kind. After she left school at 14 she frequently changed her jobs, and failed to make a success of any of them. She had no ambitions, but her main interest in life seems to have centred round sex. Even here, however, she appears markedly ego-centric, for although she preferred male company and indulged in sex play and masturbation, she evinced no real affection for her boy friends. Women she regards as rivals, and was avowedly jealous of one of her sisters whom she considered prettier than herself. In spite of her sexual libido she was so childishly and egocentrically attached to her mother, who provided her with the protection she desired against the harsh contacts with reality which mature responsibility inevitably brings, and which her timid and egocentric nature feared, that she always declared she would never marry unless her mother could live with her.

Her first severe obsessional symptoms began at the age of 18. At this time ideas came into her head about people committing suicide, gassing themselves, or cutting their throats, and whenever these ideas came she had to do whatever she was doing at the time over and over again. These ideas may have been sado-masochistic manifestations of her sex impulses. The pre-operative Rorschach test seems to give some confirmation to this view; throughout there was an excessive pre-occupation with sex, e.g. she gave a similar response to cards III, IV and VI, viz. "the bottom part of the body, may be female"; and she said of all the cards that they resembled one another, indicating that they all suggested female anatomy. Her response to the emotional effect of card II was very interesting. "I think these are like two animals—cows. The red part looks like blood. I wondered if they were male and female; I don't know why; they both look the same. I think I said when I first saw them (she had seen the first two cards on a previous occasion) they might be being slaughtered, when I thought I saw blood." In the discussion the only reason she could give for thinking them male and female was the fact of there being two.

These sado-masochistic phantasies probably gave the patient considerable sensual pleasure; when interviewed prior to the operation she volunteered that she always liked to hear about other people's downfall. At the same time she was troubled by a sense of guilt, and it was this that led to her excessive worrying. "I worry because I've got a guilty conscience." "I think of all the wicked things I have thought about." The obsessional habits and the later obsessional rumination were probably defence mechanisms against an expiation of these criminal phantasies.

The neurosis was so severe that she had entirely given up work at the age of 22 and was wholly dependent on her family, whom she burdened excessively with her miseries and her scruples. She was under medical attention for many years, and had received various forms of treatment before leucotomy in 1943.

After the more immediate post-operative effects of anergia and foolish euphoria had worn off, she seemed for a while slightly but definitely better. She ceased to talk about her worries, read more than she had done for years, slept better, and seemed more genuinely fond of her young man. She married in 1944, but unfortunately her husband, though intelligent, is also neurotic, and the marriage has not been a success. As her husband was conscripted in the Pioneer Corps, she continued to live with her parents. She openly despises him and thinks him lacking in "male

assertiveness," and has only a profound contempt for his interest in music and poetry and his "feelings for humanity." The patient herself now likes reading "romances," i.e. erotic love stories, and explicitly states that she has no interest whatsoever in humanity. It is worth noting here that in a recent Rorschach test, performed elsewhere, there were reported to be 11 animal movement responses, FM, and no human movement, M, indicating the existence of very strong sexual libido. Sexual relations with her husband are unsatisfactory, and she states that she is much more passionate than he. There is constant quarrelling and bickering, and she now openly enjoys saying cruel things and inflicting suffering on others.

She is extremely idle and does little in the house, and is still excessively meticulous and very slow. She takes no interest in anything outside her own needs and frustrations, is irritable, resents noise, intolerant of her young brother, jealous of her married sisters, and inconsiderate.

Recently she was admitted to a psychiatric hospital for further investigation. Here she was disliked by most of the patients and the staff, and though she complained of "being terrified" of everything and of "suffering agonies," there was no evidence of any depth of emotion. She admitted taking no interest in the other patients' progress, and appeared amazed that they should show sympathy with her. She was idle, and exhibited a few obsessional symptoms. During her stay there was, however, some slight improvement noted as the result of hospital routine and discipline.

In this case leucotomy has undoubtedly relieved the patient of her conflicts and of the emotional distress which these caused her, but appears to have done so by removing the "conscience" which was one of the elements in the conflict, leaving the field open to the aggressive sadistic impulses associated with her overwhelming erotic interests. She is entirely egoistic, and completely lacking in feelings for other people. The behavioural habits which she acquired during the years prior to the operation are now persisting relatively unaltered, though one of the motive forces, namely her conscience or a sense of guilt, is no longer operative. Her conduct is little changed and she is definitely more unpleasant and a more amoral person than she was formerly.

The second case, which it is also thought advisable to report fairly fully, is that of V. B—, a man now aged 48, who was one of the earliest patients treated by leucotomy at the B.N.I. in 1941.

He also gave a long history of nervous trouble, and was inclined to date it all from the first world war, during which period he was in the Army for 3 years and received two small gunshot wounds. He married soon after his discharge from the Army and has a family of 4 children. He was a self-absorbed, irritable, quick-tempered person, intolerant of noise, and with no real interest or hobbies. He never made friends, and was a hard, unsympathetic man who is said to have led his son a dog's life, and was occasionally violent to his wife. He had many jobs of the semi-skilled or labouring type, but was frequently off work with nervous upsets and was unemployed for 5 years. Nevertheless he was always clean and neat, did not use bad language, and was strict with his family, insisting that they observe the conventional proprieties.

In the second world war he was considerably upset by the air-raids, and broke down completely after he had been detailed to clean up a shelter in which many people had been killed by a daylight raid. He became unable to eat and sleep, and just wandered about the streets hardly knowing what he was doing; later became unable to concentrate and was always listening for sirens. His distress was mainly egocentric, and was caused by the apprehension of danger to himself, but it was accompanied by a sense of shame concerning his own cowardice, and he was upset by the relatively nonchalant attitude of his wife and children: "I felt ashamed because they were all so much better about the raids than I was."

After the operation he became relatively indifferent to the air-raids, but some time afterwards when working on an aerodrome near where bombing practice was being carried out, he found it upset him and had to give up the job; but he ceased to worry the moment he was away from the immediate threat of danger. He has

had several jobs, but seems to have been very casual about his attendance and probably also about the standard of his work, and it is probably for this reason that he is unemployed and has been for some time.

He has now become so difficult that the family are finding it impossible to live with him. He seems to have no feeling for anyone and is intensely selfish and intolerant. He is very lazy and rarely goes out, except for an occasional visit to a "pub" and his weekly attendance at the Labour Exchange. Flies into rages over trivialities and is sometimes violent. He wants everything for himself, and will not tolerate the slightest disturbance of his own comfort. Mimics and bullies the children, is very argumentative and uses filthy language. He tends to behave better in the presence of outsiders. His wife writes: "If any of the girls are ill, they are afraid to stay at home as he says they are shamming, and if I say I have an ache or pain he says he is sick of hearing about them, and when I fall or cut myself he simply laughs about it; in fact, it is the only time he laughs, when anyone is in distress or hurt."

He attends to his own toilet and is fairly particular about his external appearance, but he is by no means as clean as he was, and his daughter thinks he has not had a bath since the operation.

The patient himself tells quite a different story, and is perfectly self-satisfied; says he gets along very comfortably with the family, feels fairly well, and is not in the least disturbed by having no job.

The description of the "man" in the Raven projection test gives his "self-portrait," and is therefore quoted in full as it is felt to be a very revealing document. The test was done on August 14, 1946.

"The Man."

"Is he definitely drawing? He might be writing—if so he will say 'Dear Sir' to start his letter with.

"He doesn't know exactly what the man might be interested in—he thinks he might be a workman of some sort and that he's definitely not a clerk or a business man. He's interested in football or cricket—a sporting man, not very old, not more than about 30 I should think. When he stops what he is doing he will think, 'I hope that will be the last of that—I hope that will settle things definitely.'

"His real work is as an ordinary factory worker. (V. B— found it hard to imagine what he likes about his work.) He is on the tidy side and might be in an engineering works.

"(What does he dislike?). Well, of course no one actually likes work—to tell the truth, no one actually likes their work—it's hypocrisy to say the ordinary workman likes being cooped up in a factory for 8-8½ hours a day. I certainly think he's no different to the ordinary workman.

"If he's under supervision the foreman or 'passer' of some description will see his work, and if it wasn't right, well, he'd be told. The foreman will think whether he's done anything wrong before, and if he has, then he will give him the sack—dismiss his services; but if he hasn't done anything wrong before, they may overlook it—quite possibly it was a slip on his part.

"He would say, if it was a first slip on the part of a very good workman, 'Well, it's wrong—don't let it occur again.' But if it had happened before, would say, 'We've warned you before, and we can't warn you again.'

"He will think, 'Well, I suppose if it's the first occasion I shall have to be more careful, but if it's the second or third occasion then I shall have to get another job, and what I shall tell them I don't know. I shall have to pull myself together and not make so many mistakes in life.'

"He likes the sort of people—well, I should imagine the common-or-garden workman such as myself; interested in sport, and perhaps the sort who go to pictures—I don't go myself—football, cricket, boxing—what the majority of men go in for.

"He prefers a man's company—male company he would prefer.

"He dislikes—well, it's hard to say. From the look of him I think he would dislike religious people—not the sort of people who just go every week to church, but those who have religious mania—duty bound to go once a week. He's not a girl's man—of course we know most men get married, and many certainly not before it's time for them to.

"What annoys him or makes him angry? Well, I should say he's a man who doesn't like being interrupted. Many like being interrupted as a chance of stopping work, but I think he is a man who likes to get on with his work.

"What does he do when he's angry? Oh well, it's hard to say. I've met some very queer people—I've met some very violent people and had to deal with them—but he might forget it by the next day.

"He is frightened by any sudden noise—like a motor-cycle back-firing, or something like that.

"When he is tired anything might worry him. I consider that anything would disturb him when he should be resting—he would consider that it wasn't right for that to happen when he wanted to rest. He would brood for a little while, and then go off on his own for some little while—possibly for a long walk—and then come home and sleep it off.

"He saw something funny—what? Well, I don't know what you would consider funny, but, er, . . . some funny things can happen, such as a . . . you might be going along the street and you might see a cat nearly run over. Well, if the cat was only nearly run over, and scrambled out of the way in time, I should consider that very funny, and I should imagine that he would consider it very funny.

"He enjoys seeing a good football match more than anything else, or alternatively a good cricket match.

"*Dreams.* Oh well, practically all of us want more in life than what we've actually got in these worldly goods, in other words, money. I should imagine that he would naturally dream that he wanted more money, and if he got what he dreamt I should imagine it was more money.

"Well, I should think myself, I should imagine that he would put that £1,000 in the Bank or invest it in some business or other and carry on with his own work normally, and let the interest accrue.

"When a man of his description has been dreaming, he usually wakes—er—in a very torpid condition. I know by my own experience, and usually I know that when I wake I am very sluggish, when I wake from a dream of any description, whether it's good or bad—and I should think he was the same.

"Well, yes, I should think that he was satisfied to a certain extent in that he's got a good job, and I think he is satisfied in doing his job, but I certainly think he has got ambitions to get a bit higher in life if he can.

"Well, I don't think he has got any particular aim in life, only just doing his own work, and it's quite possible he does things, such as—er, investment on a football pool, or horse racing, or anything like that. That's his one ambition in life, I think—is to make money that way.

"Well, I certainly admire him by what I think of him, because I think he's rather inclined to be broad-minded, and addicted to sport generally.

"Well, I don't know that there is anything I dislike about him. I can't see that there is anything the matter with him that I could dislike. Well, I think I've given as good a description of him as anyone could.

"Well, I should imagine he was like myself—I should think we're near enough the same person as regards likes and dislikes.

"Well, I certainly think I like the same things generally. I live the same sort of life that he would live as regards sport and work, and I think it's—er, well, we're near enough the same person."

The portrait is undoubtedly that of a materialistic egoist; there is no mention of nor consideration for any other person. His description of something funny confirms his wife's statement, since the only example he gives is that of a cat being nearly run over.

The other case, A. C—, now aged 37, was an unmarried woman who, having been fairly strictly brought up by her grandmother, had for many years earned her living as a barmaid and prostitute. She then lived for 7 years with a man, having one illegitimate son by him. Her illness was precipitated by this man's desertion of her. After admission to hospital she was difficult, hostile, sullen, and negativistic, but she continued to evince some affection for and interest in her son, and

would respond slightly to kindness, and it was obvious that at least some of her behaviour was motivated by feelings of shame and self-reproach. She imagined people said abusive things about her, which made her lose her temper and caused her to shout back at them.

After the operation she became much more hostile, and refused to co-operate at all, saying that she hated women, and that all she wanted was a man and that she had always wanted men. She bitterly resented the enforced abstinence of hospital life and was truculent and aggressive, and finally relapsed into mutism. She no longer evinced any interest in her son.

In a recent paper, detailed histories were given of 10 other patients treated by leucotomy at the B.N.I., and while all these can be said to have benefited from the operation, nevertheless in some of them the accentuation of certain undesirable traits of character can be seen, though the character considered as a whole shows many improvements which offset and counterbalance these.

If we now turn to the study of the most successful cases, it is also evident that the character of the person prior to his illness is of more outstanding importance than the clinical type of illness. I shall only briefly quote two cases to illustrate this :

M. W—, now aged 56, was operated on in August, 1941. He was the son of a railway official, who later became a miner in order to earn bigger money for his wife and five children. The patient himself rose to a position of considerable responsibility as a departmental manager in a large industrial concern. He was energetic, conscientious, capable, and actively interested in religion of the verbose emotional type. He was nervous, self-conscious, self-critical, and inclined to worry. His nervousness increased after the outbreak of war in 1939 and he began to suffer from abnormal physical sensations, particularly in his groin. He expected the Germans to begin large-scale bombing immediately, and whether or no this led him to consider his own preparedness for death and judgment, it is certain that he became preoccupied with certain minor sexual misdemeanours of his youth, and unjustifiably attributed his new and disturbing physical sensations to syphilis. He began to suffer from severe insomnia and loss of appetite, and became profoundly depressed and actively suicidal.

His recovery after the operation was slow, and several months elapsed before he was fit to be discharged and again before he was fit to resume work, in 1943. With his consent we subsequently contacted his employers, who are perfectly satisfied with him, and whose only criticism is that he seemed to show a little jealousy of the man who deputized for him during his illness.

His wife is very pleased, and finds him better than he has ever been—calmer, less excitable, less worrying, less self-conscious, but still active, alert and quite as considerate and affectionate as formerly.

L. H. W—, now aged 40, was the son of poor parents who rose by his own ability to be a bank clerk. He had one brother and one sister. He was brought up in a very religious atmosphere, with very strict views about sex. Although he discarded the religious beliefs of his parents, he remained very scrupulous and conscientious, self-conscious, reserved, anxious to be friendly but not always succeeding, undemonstrative, and with considerable sex-repression. He lived with his parents and contributed largely to the family budget, and his humble origin and rather unusual appearance gave rise to feelings of inferiority. Finally he began to suffer from severe insomnia and became increasingly preoccupied with and depressed by his anxieties, and on one occasion attempted suicide by taking 28 medinal tablets.

Since his operation in 1943 he has returned to the bank, and he married, in the summer of 1945, a girl who had known him for 11 or 12 years. She seems perfectly satisfied with him ; says he has more confidence, is on a more even keel, and is more sociable though needs a little pushing from her. He is kind, but perhaps a little more selfish than he used to be and not quite so tactful, and doesn't care so much about the effect on people. Whereas before, owing to the poverty of his childhood he was unduly careful with money, he is now more generous. He wants to keep his marriage as happy as possible, and has many interests ; likes pottering

about the house, enjoys cigarettes and his "pint," reads his literary "favourites" regularly, enjoys swimming, and is interested in nature, birds, astronomy and photography. Still likes to study and do things properly. Has no interest in religion, is quite content with the earth as it is and doesn't bother with the hereafter; thinks that when we die it is the end.

His wife feels that the results of the operation have been entirely good, and has not noticed any defects which she can attribute to it.

It is apparent that in spite of difficulties due to environment and temperament these two men had both achieved considerable success, and were playing a useful and responsible part in the social community and were liked and respected by those who knew them. In both there was also considerable conscientiousness and anxiety about their ability to live up to their self-imposed standards, and they were unduly self-conscious and troubled by unnecessary scruples. The removal of this scrupulous conscientiousness relieved them of the disabling symptoms produced by it, and so effected considerable improvement. The total personality, however, was basically well adjusted both to the environment and the social community, as evidenced by their earlier success; they had no outstanding anti-social or immoral impulses, and their post-operative behaviour therefore accords well with the conventional demands of the society in which they live.

DISCUSSION.

If the three failures are studied together, certain features emerge. All showed egoism and lack of social adjustment. They had a poor work record, and had none of them achieved any real success, nor had they given much evidence of any real altruistic affection. It is true that W. W— was very attached to her mother, but in a childish, dependent way; that V. B— was married and had three children, but he seems to have shown them little affection, and his remark in the post-operative Raven projection tests seems very self-revealing—"He's not a girl's man; of course most men get married, and many certainly not before it's time for them to." A. C—, although socially the least respectable, nevertheless does seem to have had some real affection for her son, and probably also for the man with whom she cohabited for 7 years.

All three had evolved their own pattern of behaviour. This was least satisfactory in the case of W. W—, who had gradually become completely dependent on her family, whom she burdened excessively with her interminable talk about her misery and her worries, and with her obsessive rites. V. B— and A. C—, on the other hand, were coping rather more successfully with life until they were overwhelmed by a relatively major catastrophe—air-raids in the one case and desertion in the other. In each case the catastrophe completely disrupted their habitual mode of life, and both became more or less psychotic. V. B— became confused, unable to concentrate, sleepless and depressed, while A. C— became hostile, negativistic and aurally hallucinated. During their illness new ways of reacting, i.e. new habits were formed, which had little in common with their former habits.

After the operation W. W— and V. B— were soon able to return to their former environment, and resume their former way of living. In many respects,

therefore, their behaviour is unchanged, the only outstanding feature being the marked increase in their egoism and lack of consideration for others.

A. C— never became sufficiently well adjusted to be considered suitable for discharge from hospital, and her present environment therefore is the same as it was during her illness, and tends to perpetuate the same kind of behaviour, a similar stimulus evoking a similar response, and she has had no opportunity to resume the habits of her pre-psychotic phase. Furthermore, the enforced sexual abstinence due to her detention in hospital aroused considerable emotion which motivated her post-operative behaviour, making her seem more hostile and unco-operative than before. It is interesting to speculate what might have happened had it been possible to allow this patient to satisfy her erotic cravings, and return to her former life of prostitution. It is arguable that under these circumstances she might have resumed many of her pre-psychotic habits, and become, if not a desirable member of society, at least able to maintain and readjust herself in the community as a prostitute.

In making a final assessment of the effects of leucotomy the problem of re-education is of paramount importance. Clinical observation and animal experiment have shown that the old topographical idea of the cerebral cortex is erroneous, and must be replaced by a more holistic view, since it has been found that if one cortical area is damaged, some of its functions may subsequently be more or less efficiently performed by some other area.

Thus the increasing utilization of vision and touch may eliminate many of the disabilities due to loss of hearing, or of vision, touch, and temperature those due to loss of sight. There is also evidence, at any rate with efferent nerves and fibres, that the function which is lost may even be recovered, and not merely compensated for by substitution.

It is therefore probable that the functions which are disturbed by section of the prefrontal fibres may later be restored to some extent by developing the latent potentialities of the rest of the cortex.

It is undoubtedly true that we are all creatures of habit, and that we become increasingly so with age. It is, of course, possible for a well-established habit to be broken, and be replaced by a new type of response, and this breaking of a habit may be brought about by the presence of external circumstances, or by an inner conviction or desire. The substitution of good habits for bad ones demands the recognition of purpose and values, and is felt as a moral obligation. It requires so much effort to break a well-established habit that it cannot be done unless the motivation for so doing is adequate.

Much of the abnormal behaviour in neurosis and psychosis is conditioned by autistic thinking and is self-determined. There is some evidence that after leucotomy the patients become more extraverted, are more susceptible to external influences, and more objective and materialistic in their outlook. If this be true, then any desired change in the patients' behaviour must to an increasing extent be conditioned from without, and opportunities must be provided for the re-establishment of previous good habits, and strenuous effort made to replace bad habits by some satisfactory ones. Furthermore, the question of adequate motivation must be seriously considered, and where there is evidence of an increased egoism, it may be necessary to base one's

re-educational programme almost entirely on motives of self-interest, relying on the judicious use of rewards. If many good habits had previously been formed, the sooner the patient can be returned to his normal surroundings the better, for the objects and events of his environment will tend to re-awaken his previous mode of behaviour. It is bad, however, to allow any patient to drift along in an environment in which he has formed unsatisfactory habits, for these will simply be perpetuated; this may apply equally to his own home, or to a hospital ward. As far as possible, old interests should be revived and new ones introduced, and a regular disciplined routine adopted in order that stable habits of a satisfactory kind may be formed.

SUMMARY.

The occasional occurrence of undesirable traits has been recorded in the post-operative characters of certain patients treated by prefrontal leucotomy.

In this paper are given reports on three cases in whom the personality after the operation is on the whole less satisfactory than it was before, and these are compared with successful cases.

The conclusion is reached that the basic character and outstanding traits of the total personality are of greater importance for assessing the probable results of the operation than the particular type of mental disorder from which the patient is suffering.

BRIEF RETROGRADE AMNESIA.

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THIS study of retrograde amnesia of brief duration is based upon information furnished by 117 persons who had undergone, according to their statements, one or more terrifying incidents. All were men on full military duty, with the exception of three civilians, included as being of particular interest. In many investigations the information has been obtained from patients in whom motives other than accuracy could have taken a part in their descriptions. A patient may invent, distort or exaggerate his amnesia for psychological, or material and pecuniary, aggrandisement. In this series 99 of the cases were voluntary applicants for officer-training.

Each subject was aware that he was being interviewed by a psychiatrist, but in spite of the importance to the candidates of appearing normal, 47 gave a history of amnesia. This is, no doubt, a minimal figure, as some would not refer to any matter they considered abnormal or detrimental to their applications. A tendency to minimize effects of terrifying incidents would be probable.

In this article the term "retrograde amnesia" will be used in the sense described by Guttmann (1944)—that is, when a sufficient length of time has elapsed for the function of recall to have "settled down again." This may be after a period of some months to many years since the incidents occurred. Russell (1935) stated that the memory of distant events usually returns before that of those more recent and that, in the post-concussional confusion period, incidents may be recalled which are forgotten after the return of full consciousness. The process appears similar, psychologically, to that which occurs under semi-anaesthesia or mild hypnosis, when repression is reduced, but may be re-accentuated when the patient has emerged from the semi-conscious state, unless he is compelled to face the subject-material previously repressed. Case 1 demonstrates the necessity of allowing sufficient time to elapse for the amnesia to be reduced to its minimum without treatment (Rudolf, 1944).

CASE 1.—Bomb exploded about 7 yards distant. For a few days after this event, the sound of the explosion, the pause while he thought "must get down," the blast on the back and the concrete falling around was all that could be recalled. Amnesia for from one-half to one minute previous to explosion. Gradually, over about 10 days, and at first indistinctly, the whole of the amnesic gap was filled in without any conscious active process by self or others.

In this paper, brief amnesia preceding an injury and amnesia associated with a terrifying incident without concomitant physical trauma will be discussed. Hysterical amnesia with a prolonged duration will be excluded.

The knowledge of amnesia depends upon the account given by the patient.

Consequently, paramnesia or retrospective falsification might possibly occur, especially as considerable periods elapsed before the subjects were interviewed. Nevertheless, previous authors, such as Somerville (1931) and Russell (1932), believe that the account given by the subject is usually accurate, although Somerville describes an exceptional, personal incident in which the patient believed, for at least 17 years, that Somerville had knocked him down, whereas another cyclist had done so. The subject on recovering from unconsciousness saw Somerville standing beside him, and associated Somerville, the first person seen after regaining consciousness, with the last event before being knocked down.

Russell (1932) reported that of 96 cases of head injury showing retrograde amnesia, in no case was memory of the blow recollected if unconsciousness had occurred. In the present series 34 cases reported unconsciousness, but not necessarily with head injuries. Of these 34, eight recollected, without receiving psychotherapy, the blow that immediately preceded the loss of consciousness.

If a subject gives a coherent, continuous and reasonable account, and if he gains nothing by denying it, a history of unconsciousness in association with an incident will probably be reliable. However, the so-called unconsciousness may, in reality, be an amnesia, the subject having been fully conscious at the time of the incident. The unconsciousness may have been a dazed feeling, which was interpreted as unconsciousness. The subject may have been informed that he had been concussed and assumed that unconsciousness had developed. Perhaps, when dazed, he may have been given drugs or an injection which sent him, immediately, to sleep (Case 2). Consequently, a statement by a patient that he has been unconscious does not necessarily imply that he has been concussed.

CASE 2.—Sergeant recalled being led to first-aid post and being in a lorry. Recalled going in ambulance to a church and being in a ship. Under hypno-analysis, recalled going to a second aid post, where he was given bromide. If analysis had not been carried out, the administration of the bromide would have been unknown, and all amnesia subsequent to this N.C.O. being in the lorry would have been considered to have been psychological. In reality it was, possibly, partly chemical in origin (Rudolf, 1944).

To obtain reliable information about the presence of unconsciousness, trained witnesses would be required, but accurate decisions of the duration of unconsciousness may be impossible to make. Consciousness may return intermittently; it may be broken by periods of sleep or unconsciousness. The subject may have carried on his activities, apparently normally, for minutes or hours after a severe blow before losing consciousness (Case 3).

CASE 3.—Recalls being struck by hockey stick, following which was conscious for about 1½ hours. Then unconscious for a day.

In view of the difficulties inherent in the assessment of unconsciousness, the statements made by subjects quoted in this article should not be, necessarily, regarded as reliable. As statements with regard to amnesia are the conscious beliefs of the subjects, such statements can be accepted, especially, as in the cases described here, a tendency to hide rather than to expose amnesia would be more likely.

PSYCHOPATHY.

According to Schaller (1939), the presence of amnesia for the injury is one of the diagnostic points between post-traumatic concussion state and post-traumatic psychoneurotic state, amnesia being present in the first.

Table I shows the percentage of psychopathic symptoms and signs found in the present series. All the cases were interviewed by the same psychiatrist for the purpose of judging their suitability for appointments, so that approximately equal investigations were made in each case. The table shows that equal proportions of those who recalled their injuries and of those who showed amnesia for the injury gave evidence of psychopathy.

TABLE I.—*Psychopathic Signs in Cases who had Received Physical Injury.*

	Recalling injury.	Amnesia.	Total.
With psychopathic signs	18 (58.1%)	13 (41.9%)	31 (33.0%)
Without psychopathic signs	37 (58.8%)	26 (41.3%)	63 (67.1%)
	—	—	—
	55	39	94

Table I shows that one-third showed psychopathic signs. That this proportion is not confined to cases who have received injury is demonstrated by Table II, in which 250 men who had not passed through terrifying experiences, and who were interviewed for the same reasons and by the same psychiatrist as those of Table I, gave a similar proportion.

TABLE II.—*Cases not Involved in Terrifying Experiences.*

With psychopathic signs	83 (33.2%)
Without psychopathic signs	167 (66.8%)
	—
	250

Tables I and II suggest that men with psychopathic signs do not appear to be more liable to pass through alarming incidents due, for example, to their own emotions, to accident-proneness or to exaggeration of events, in reality trivial, than do others without these signs. The tables give no indication of the true proportion of psychopathy amongst the adult male population of this country, as selection of the men had been made, firstly for the Army and secondly for promotion. A further selection had taken place, for many men had been referred by combatant officers because they were considered "queer" or unusual.

The criteria of psychopathy were taken to be evidence of abnormal emotional conditions, even though these were not of sufficient intensity to affect appreciably the efficiency of the sufferer. Evidence of psychopathic symptoms at a early age only, e.g. childhood fears of the dark, were not used as criteria, although those who had suffered from marked childhood fears were still, possibly, affected emotionally by these earlier disturbances.

CASES.

The cases described briefly below have been selected as being representative of different aspects of the subject, They can be divided into :

- A. Full recall of injury with, or without, unconsciousness.
- B. Amnesia for injury with, or without, unconsciousness.
- C. Amnesia antecedent to injury.
- D. Amnesia without injury.
- E. Repeated terrifying incidents.
- F. Indefinite retrograde amnesia.
- G. Recoverable memory.
- H. Non-recovered memory.
- I. Fear without injury.
- J. Post-traumatic unconsciousness.

A. *Full Recall of Injury.*

CASE 4.—Struck by lorry. Recalls head hitting vehicle. Unconscious.

CASE 5.—Bicycle wheel struck curb. Recalls being thrown off and nose striking pavement. Unconscious.

CASE 6.—Car struck a mine. Hit on chin by Bren gun. Recalls movement of car and blow on chin. Unconscious.

CASE 7.—Recalls seeing flying bomb approaching, running from it and hearing its explosion. Unconscious.

CASE 8.—Recalls sound of explosion, being carried along through the air and hitting wall of hut, which collapsed. Not unconscious.

CASE 9.—Heard explosion, saw flash, felt his bicycle slide from under him and recalls falling on to ground. Not unconscious.

CASE 10.—Recalls being lifted off bicycle by blast and hitting the ground. Not unconscious. Cannot recall hearing the sound of the explosion that produced the blast. This does not necessarily mean that an amnesia for the explosion occurred. Cases 11 and 12 demonstrate this point.

CASE 11.—Recalls walking, carrying pail of water in each hand, when heard sound of the bomb falling. Felt push in the back from the blast and fell to the ground. As recalled sound of the bomb falling and feeling the blast, repression of the intermediate event, namely, the explosion, is improbable. Both the sound of the bomb approaching and the anticipation of death or injury as he was being pushed to the ground would be alarming. Not unconscious.

CASE 12.—Recalls standing, seeing flash of explosion, feeling the blast, being carried about one yard and sitting down on the ground. Not unconscious. Here, also, repression of the sound of the explosion, when both the flash and the blast were remembered, is improbable.

B. *Amnesia for Injury.*

The cases immediately following demonstrate that amnesia is not related to the type of accident.

CASE 13.—Recalls crashing of falling building and of his being in the air, but not of falling and striking the ground.

CASE 14.—Recalls whistle of falling bomb and picking himself up about 4 yards away from his first situation. Amnesia for the sound of the explosion, for travelling through the air and for striking the ground. Not unconscious. If this subject had been travelling at an acceleration of from 300 to 400 g, the acceleration which is required to produce concussion without being struck by blast or other agent (de Haven, 1942), he would have been destroyed on striking the ground.

CASE 15.—Recalls saddle-slipping and his coming off his horse, but amnesia for flying through the air and striking iron fence about 3 yards distant. Unconscious.

CASE 16.—Recalls, when on motor-cycle, seeing cyclist ahead, thinking must turn to right, putting on breaks and shutting off petrol about 15 yards from the cyclist. Amnesia for striking cyclist. Unconscious.

CASE 17.—Was passenger in car struck by another car. Amnesia for about one mile before reaching scene of accident. Unconscious.

CASE 18.—Drove motor-cycle into lorry. Amnesia for about $1\frac{1}{2}$ miles preceding accident. Unconscious.

CASE 19.—Recalls seeing knee coming towards him about 6 inches distant, when playing Rugby football, but amnesia for the blow. Unconscious.

CASE 20.—Recalls beginning of dive to tackle at Rugby football, but amnesia for finish of dive and for kick on head. Unconscious.

CASE 21.—Recalls walking across road and placing foot on opposite kerb. Cannot recall seeing bicycle approach and feeling it strike him. Unconscious.

CASE 22.—Recalls walking on edge of swimming-bath, but amnesia for foot slipping, head striking floor and falling into the water. Unconscious.

CASE 23.—When walking along breakwater fell on to shingle below. Amnesia for walking on breakwater and for falling. Unconscious.

c. Amnesia Antecedent to Injury.

CASE 24.—Woman knocked down. Amnesia for posting letter on a country 'bus until in her house on opposite side of road. Hypno-analysis carried out in sessions spread over several days. Memory regained for crossing road after 'bus had begun to move, for seeing cyclist coming round towards her from front of 'bus, for seeing his hat fall off and his front wheel skid towards 'bus, for taking step towards 'bus, for being struck in back, finding herself on the ground lying on face and towards right shoulder, hearing sound of bicycle and man falling on her and feeling back of her head struck. The sensation of feeling the head struck was recalled one visit before that in which she recalled the feeling of her back being struck, and two visits before the memory of falling on the ground was regained. Apparently the most repressed part of the amnesic period was not in direct connection with the injury, i.e. the blow on the head. If the retrograde amnesia had been due to the physical injury, the most difficult part of the memory to recover would have been that immediately preceding the injury. The most difficult part, i.e. the last to be regained, was the passage through the air while the woman was falling to the ground.

Once safely on the ground, the fear of serious injury or death was less great than when falling to the ground, the falling being of greater emotional significance than the injury to the head.

CASE 25.—Man could jump easily over rope or solid log 3 ft. in height, but unable to make himself jump over solid wall of equal height. Wished to be trained as paratrooper, but when ordered to jump wall about 2 ft. 6 in. in height and about 1 ft. 6 in. in width, ran up to it, put his foot on it, but was unable to jump over it. About half-a-dozen unsuccessful attempts. Consequently unable to become paratrooper.

At 14 years of age, when jumping over wall 2 or 3 ft. in height caught foot on it, fell forward and broke wrist. Recalled jumping and hitting ground, but amnesia for striking wall with foot, although informed by observers had done so. Not unconscious.

Presumably, the moment of greatest fear was as the foot struck the wall and so previous to the possibility of greater injury due on striking the ground.

d. Amnesia Without Injury.

The brief period of amnesia preceding an injury is often thought to be due to organic disturbance. The fact that it is possible to recover the memory up to, and including, the moment of physical impact, even many years after the incident, points to a psychological rather than to a physical cause. Amnesia similar to that preceding injury may occur without any physical trauma, as is shown by the following cases:

CASE 26.—Amnesia, often known as “black-out” amongst paratroops, for first and second jumps when training. It commenced, as is usual, as jump began and, on first occasion, terminated as the parachute made the usual sound when coming out of its haversack. The amnesia, therefore, ceased before the occurrence of the jerk due to the ‘chute opening, but as soon as the man knew safety was assured. In many cases the amnesia ceases when the tug of the ‘chute opening is felt.

CASE 27.—An experienced paratroop major, with 27 jumps to his credit, stated that “black-outs” occurred in each of his first few jumps until the ‘chute opened. The lengths of the periods of amnesia became progressively less until they ceased at the tenth jump, when, so he said, he “had gained complete confidence in the equipment.” No further amnesia, although, as is usual with all paratroops, suffered from marked fear until the light in the aircraft was turned on.

CASE 28.—An instructor who had jumped from aircraft between 30 and 40 times in controlled jumps, i.e. automatic opening of ‘chute, carried out a free jump, i.e. in which he himself opened the ‘chute by pulling the rip-cord. From the moment of jumping at 3,000 ft. until he pulled the rip-cord at about 600 ft., he was unable to recall his sensations. Amnesia, therefore, occurred when this officer was unable to rely on an automatic process for his own safety but was compelled to rely on himself. He pulled the rip-cord considerably later than did three others who jumped with him.

The amnesia is not likely to be due to falling through the air or to somersaulting, as amnesia is not only not constant, but comparatively rare amongst paratroops. Case 29 demonstrates that memory can be retained when upside-down. Paratroopers and acrobats are aware when they are somersaulting.

CASE 29.—Baled out at 26,000 ft., but did not pull rip-cord until below cloud at 20,000 ft. During this fall recalls seeing feet higher than head. Saw one knee boot coming off, bent to it and pulled it on. Felt as if in easy chair with feet raised. When pulled rip-cord must have been travelling at about 120 m.p.h. (*Brit. Med. J.*, 1945). The maximum velocity that can be tolerated, without discomfort, providing jaw movements or swallowing are carried out to clear the ears, is stated to be 114 m.p.h. (Matthews, 1945.)

E. Repeated Terrifying Incidents.

Although the fear of imminent injury or death is nearly universal, its intensity varies from person to person, and in the same individual from incident to incident. Of 18 subjects who had undergone more than one alarming experience, 10 recalled the whole of their multiple experiences, including the moment of impact; 7 showed amnesia for one experience only, and 1 individual amnesia for more than one. In the seven, the amnesia was for the first incident in each case, and not for the second.

Of four cases with three experiences each, one recalled all details in all three experiences, one showed amnesia for the first and third experience, the third for the second experience only, and the fourth for the third experience only.

The following cases are illustrative:

CASE 30.—*First experience*: Holding hose-branch, when heard bomb explode and was blown sideways.

Second experience: Lying down, two days later, when heard bomb falling and was rolled over by blast.

Third experience: On following day, standing, when heard explosion of land-mine and was blown about 5 ft. and over.

No amnesia for any incidents.

CASE 31.—*First experience*: Passenger in car when it was struck by a second car. Recalls car being pushed across road, but amnesia for its striking a wall and for his head being struck. Unconscious.

Second experience: Recalls seeing flash of explosion, feeling blast hit him, being carried along about 12 ft. and being thrown over.

Third experience : Walking when found himself lying down. Amnesia for cause of this action.

CASE 32.—*First experience* : Recalls standing, being blown over, and rolling over and over until fell into trench.

Second experience : Recalls sound of explosion when in truck. Amnesia until found himself getting up from grass. Probably unconscious for short period.

Third experience : Recalls sound of other, more distant, bombs falling and exploding, but not the sound of the nearest bomb exploding, but only of its fall. (See Cases 11 and 12.)

CASE 33.—*First experience* : When cycling, in dazzling sunlight, rode into van. Recalls striking van and falling on to road. Not unconscious.

Second experience : Recalls, when cycling, motor-cycle approaching about 10 yards away. His front wheel was struck by motor-cycle, but amnesia for impact. Unconscious.

Third experience : Recalls engine of flying bomb stopping, bomb exploding, ceiling shaking and coming down on to him. Not unconscious.

CASE 34.—*First experience* : Recalls stone coming towards him, attempting to dodge it and it striking him on the bridge of his nose. Unconscious.

Second experience : Recalls sound of explosion and being pushed to ground. Not unconscious.

CASE 35.—*First experience* : Recalls shell exploding, going flat and being wounded in neck.

Second experience : Recalls explosion of shell on wall of trench and his going flat. Not unconscious.

CASE 36.—*First experience* : Recalls flash of explosion, travelling through the air and falling down on to path. Not unconscious.

Second experience : Recalls sudden orange glow and being pushed on to ground. When sitting on the ground, heard the explosion. Not unconscious.

CASE 37.—*First experience* : Recalled sound of explosion and feeling the blast.

Second experience : Knocked out when boxing. Recalls the blow.

CASE 38.—*First experience* : Recalls explosion of a flask in a laboratory and of burning methylated spirit being thrown on to his face and hands.

Second experience : Recalls explosion of bomb and his falling on to ground.

CASE 39.—*First experience* : When cycling, his front wheel struck by car from the left. Recalls nothing after about 100 yards before scene of accident. Unconscious.

Second experience : Recalls sound of explosion, smoke, flying bricks and the blast blowing him over.

CASE 40.—*First experience* : Recalls being lifted off ground and flying through the air, but amnesia for striking wall, furniture and floor. Unconscious.

Second experience : Recalls explosion of bomb, travelling through the air and coming down on to the ground.

CASE 41.—*First experience* : When climbing wall, grasped stone flower-bowl, which broke. Amnesia for falling, striking ground and raising himself on hands and knees. Unable to recall flower-bowl falling on his chest or the cause of a bruise on back.

Second experience : Recalls hearing bomb falling, feeling blast strike him as he was dismounting from his bicycle, and hearing the explosion. Not unconscious.

CASE 42.—*First experience* : Recalls falling, but not striking a boot with his right temple. Unconscious.

Second experience : Recalls that, when crouching down, heard explosion and went over on to floor. Not unconscious.

CASE 43.—*First experience* : Saddle of cycle fell off. Recalls coming off bicycle, feet hitting ground, falling towards ground, but amnesia for head striking ground although chin injured.

Second experience : Recalls bomb exploding and windows and ceiling falling.

F. Indefinite Retrograde Amnesia.

In some cases, such as the following, where the subject was in bed and, perhaps, sleeping, doubt exists as to whether retrograde amnesia occurred. Sleep may have been sufficiently deep for repression to be unnecessary. That

sleep may not be affected by an explosion, although other effects are disturbing, is shown by an experience in which the author awoke feeling the bed vibrating. A few minutes later an explosion was heard followed by vibration of the bed equal in extent and duration to the first. Presumably, as equal vibration occurred on both occasions, the sounds reaching him would have been equal.

CASE 44.—Asleep in bed. Woke up on the floor without recollection of an explosion or of being lifted out of bed.

CASES 45 and 46 demonstrate the awareness of the situation. Both cases recall sounds of the explosions, being lifted out of their beds and dropped on to the floor.

G. Recoverable Memory.

Usually with treatment, as for example, hypnosis, full memory can be regained up to, and including, the moment of impact, as shown by Cases 47 and 48, described as exemplifying widely different types of trauma :

CASE 47.—Tram-driver showed amnesia from a passenger entering his tram, about 50 yards before the tram-car crashed into a 'bus, until he woke in hospital. Under hypnosis, memory regained up to the caving-in of the metal front of tram striking him in the chest and knocking his head on door behind him.

CASE 48.—Clergyman possessed amnesia for room in house in which he had lived for 10 years. Under hypnosis, regained memory of room, and of a friend of his father losing his temper, rising, coming towards him, placing his hands on his throat and nearly strangling him, about 30 years previously.

H. Non-recovered Memory.

In some cases the brief period of amnesia immediately preceding the impact, whether or not unconsciousness occurs, appears to possess particular significance. In these cases the final fraction of a second may not be filled in, as exemplified by Cases 49 and 50 :

CASE 49.—Amnesia for getting into lorry until in hospital. Under hypnosis, memory regained for entering lorry, sitting on a box, lorry turning a corner, box swaying, going over side of lorry, falling head-first towards road until eyes level with wheel-hub. The final part of the fall of one or two feet and striking the ground was not recovered.

CASE 50.—Adjutant showed amnesia for stopping one of his lorries and riding in it until awoke in hospital. Under hypnosis, memory recovered for riding in lorry, standing looking over roof of cab, lorry striking stationary car, his leaving the lorry and travelling through the air upwards. Falling and striking the ground was not recovered.

Similar incomplete results were obtained by Sargant and Slater (1941) in neurotics, who dated their amnesic disturbances from concussion or from being blown over. These authors considered that these very brief periods of amnesia remaining after treatment were presumably organic in nature.

This view is supported by the evidence from Cases 51 and 52, in which no possibility of the knowledge of an impending accident existed. In both cases the blow causing concussion fell on the back of the head whilst the soldier was performing work unassociated with danger. Neither man could have been aware of the approaching object. In one case no retrograde amnesia occurred ; in the other all events up to, but excluding, the blow were recollected.

CASE 51.—As clearing undergrowth was struck on back of head by a tree felled by another man. Was unaware that tree would strike him. Recalls blow; no retrograde amnesia; concussed.

CASE 52.—As bent down, plank struck him on back of head. Concussed and cannot recall blow. Was unaware plank was falling, and man working on scaffolding above him was unaware plank had fallen. No other man in neighbourhood who could have warned him of the danger.

In neither case did retrograde amnesia, other than for a fraction of a second, occur.

1. Fear Without Injury.

Feelings of fear were well described by—

CASE 53.—Captain who had made 13 parachute jumps and who was accustomed to running in flat races in which physical injury was improbable. Stated that feelings of fear, e.g. in stomach, were identical whilst waiting to start in a race and waiting to jump from aircraft. In the first, the condition was of possible psychological trauma, i.e. loss of prestige, whilst in the second it was of possible physical trauma, i.e. death.

The possibility that the whole, or a part, of the fear while waiting to jump was due to a possible loss of prestige due to showing fear or refusing to jump is unlikely for two reasons. First, it is common knowledge among paratroopers that fear is always felt before jumping, although it may stop when the light goes on. The regularity of this fear was reported by a man who had made 40 jumps. Second, fear of refusing to jump cannot be of great intensity when a man has jumped many times and has complete confidence in his equipment. In addition, he knows that if he hesitates and the R.A.F. man does not push him out of the aircraft, the man behind him in the stick will do so. In consequence, he is unlikely to fear that he will not leave the plane.

Amnesia can, of course, be due to guilt. This cause is unlikely in paratroopers, as the men are carrying out their acknowledged duty.

An instructor, who had carried out between 60 and 70 jumps, found that the men, although always feeling fear, do not invariably consciously attach their fear to the possibility of becoming a "Roman Candle." Some may fix their fear upon going through the door of the aircraft and others on the landing. On operations the men are usually more anxious about the operations than the jump, although when on non-operational jumps the same men would be consciously afraid of the jump itself.

Although these "black-outs" are normally unconscious protective devices, one officer stated that he was terrified so greatly during his first two or three jumps that he compelled himself to make his mind blank. This officer did not appear to be a coward, since later he volunteered for, and was engaged in, special individual work in Greece of a highly dangerous nature.

The "black-outs" of parachute jumping are causally dissimilar to those occurring in air-crew when an aircraft goes into a tight turn. The last occurs constantly, being related to the magnitude and duration of *g*, and not to the subject having confidence in his aircraft. The tight turn, by increasing *g* considerably, increases the weight of the body-tissues. The writer has no information as to whether the retrograde amnesia and disorientation found after unconsciousness due to complete "black-out" in air-crew are physical or psychological in origin.

J. *Post-traumatic Unconsciousness.*

The length of the post-traumatic unconsciousness is commonly used as a gauge to the severity of the physical injury. If the pre-traumatic amnesia were also produced by the physical injury, a relationship between the length of the retrograde amnesia and the post-traumatic unconsciousness might be expected. As far as the subjects' statements are reliable, Table III shows that no direct relationship exists. The divergences are so great, e.g. retrograde amnesia of one or two seconds with post-traumatic unconsciousness of 15 minutes in one case and of 24 hours in another, that some significance may, perhaps, be attached to them. Russell (1932) believes that the patient's "subsequent memory of when he woke up provides a not inaccurate indication of when consciousness returned," so that "the duration of unconsciousness can be estimated with fair accuracy even when the patient is seen for the first time long after the accident."

TABLE III.—*Length of Retrograde Amnesia and of Post-traumatic Unconsciousness.*

A=Duration of retrograde amnesia.

B=Duration of post-traumatic unconsciousness.

Number of cases.	A.	Number of cases.	B.
13	Under 1 sec.	2	Few secs.
		1	2 mins.
		2	Few "
		2	10 "
		1	15 "
		1	1 hr.
		1	2 hrs.
		1	Few "
		1	7 "
		1	3 days.
2	1 sec.	1	4 hrs.
		1	6 "
4	1-2 secs.	1	15 mins.
		1	3 hrs.
		1	8 "
		1	1 day
1	5 secs.	1	15 mins.
1	2 mins.	1	6 hrs.
1	Few mins.	1	1 min.
1	20 mins.	1	2 days

DISCUSSION.

Mayer-Gross (1943) examined the brief retrograde amnesia occurring in patients undergoing electric convulsive therapy. As he found that, in more than 100 experiments in over 40 psychologically abnormal persons, amnesia occurred for subjects with, apparently, no emotional value, he considered that retrograde amnesia could not be due to guilt or the unpleasantness of the situation.

The view that retrograde amnesia is due to cerebral injury destroying the traces, or engrams, of the immediately preceding impressions cannot be accurate in paratroopers, since no cerebral injury occurs.

Mayer-Gross (1943) advances the view that retro-active inhibition may occur. In this inhibition the latest memory traces, which are still in process of consolidation, are prevented by the cerebral disturbance from being properly formed and organized. Mental or physical effort immediately following learning disturbs recollection. Neither cerebral disturbance nor effort takes place during a controlled parachute jump. The 'chute opens without the man taking any action, and the sensation of floating down to the earth is pleasant and, frequently, so exhilarating that the man sings as he descends, even below the level of 18,000 to 22,000 ft., at which euphoria due to decrease of oxygen may occur (Matthews, 1945).

Since, with appropriate methods, memory can be recalled, retro-active inhibition cannot have prevented the latest memory traces from being formed, or, if formed, they cannot have been destroyed.

The dread of electric convulsive therapy which, although less than that of chemical convulsive therapy, may cause the patient to refuse further treatments, may possibly produce the retrograde amnesia examined by Mayer-Gross. The fact that the subjects forgot non-emotional objects shown to them during the period immediately preceding the treatment is to be expected, for all objects, whether with or without emotional value, are consciously forgotten during a period of complete amnesia.

Whether or no the retrograde amnesia associated with electric convulsive therapy is causally similar to that preceding terrifying incidents, that of the parachute jump appears similar in origin to the retrograde amnesia associated with physical injury.

Parfitt and Gall (1944) stress mental preoccupation as a cause of prolonged amnesia. In brief retrograde amnesia of a psychological type a strong preoccupation with the fear of death is, presumably, present, although consciously there may be no knowledge of this. During hypnosis, the abreaction may be exceedingly marked as the terrifying incidents are brought into consciousness. In addition to the major events, minor sensations, unconnected with the danger, e.g. colour of the surroundings, may be described. If the mind had been entirely preoccupied with the intense fear, matters not directly connected with the cause of the fear would have been ignored.

Once repression has been initiated by fear, a time-mechanism rather than a subject-mechanism is in force. The beginning of the repression is preceded by conscious thought, either pleasant or unpleasant, but its end appears to be determined by an unconscious process appreciating that danger is past.

CONCLUSIONS.

From a study of 117 cases the following conclusions were reached :

1. Brief retrograde amnesia may occur—

- (a) Preceding injury with or without unconsciousness.
- (b) Preceding anticipated, but not actual, injury.

2. Duration of retrograde amnesia is not related to the duration of post-traumatic unconsciousness, as given by the patient.

3. Period of greatest repression may be immediately before physical trauma or may be a fraction of a second before the trauma occurs.

4. Of cases undergoing injury, equal proportions of those recalling injuries and of those with retrograde amnesia gave evidence of psychopathy, as assessed by the same observer.

5. Either similar or dissimilar reactions may occur in an individual undergoing more than one terrifying experience.

6. Retrograde amnesia is not due, necessarily, to cerebral injury destroying traces of impressions, to retro-active inhibition, to mental preoccupation or to organic causes. The hypothesis is supported that retrograde amnesia connected with actual or possible physical injury is, in large numbers of cases, due to repression caused by fear, with the exception of a period of less than a second in duration, which may be due to organic disturbance as from a blow to the head.

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CLINICAL PROBLEMS OF REPATRIATES.*

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IN recent months most of us have seen patients who have been in the Services and who now present features of psychiatric illness. Many of them are in the ordinary run of our experience, and we have no difficulties—other than the usual ones—of understanding the origins and pattern of their present distress. By and large, the ordinary clinical breakdowns occurring in the Services were of a kind familiar to us before the war, while during the war we became familiar with most of the disturbances of behaviour and feeling produced by specific stresses of service life. Many patients with difficulties of these two kinds were discharged the Services in the past, and others have since been demobilized. The large and compelling problem of their treatment and effective rehabilitation should not blind us to another newer problem—that of ex-servicemen who made satisfactory adjustments to civilian life before the war, and to service life during the war, but who are now in severe difficulties under the stresses presented to them by their return to civilian life. In a manner unexpected by the majority, they have become ill-at-ease in familiar surroundings, phobic, depressed or irritable, asocial, confused, retarded, aggressive, antisocial or restless. There is a mass of evidence to show that in addition to the clinical symptoms which lead some of them to seek help from medical men, their damaged attitudes disrupt other aspects of their lives—social, domestic or industrial—in serious and subtle ways.

It would be easy to exaggerate the extent and the depth of these disturbances, and it would be tempting to shut our eyes and to argue the problem in terms of intrapsychic conflict, but it would be folly to assume that it is a problem too small for consideration, easy to understand, one to be dismissed as a natural consequence of demobilization which time will heal. Tens of thousands of men are or have been involved in psychological difficulties of this kind, and investigations have shown that far from there being a “natural” cure after a few months of civilian life, the passage of time may only harden the trouble and compel the individual to live with his social potential severely blunted; to pursue life as it were with one cylinder missing.

Description of the psychological difficulties of ex-servicemen is made difficult by the very wide range in kind and severity of their reactions; they vary from acute schizophrenia to a more common inability to enjoy the taste of life. Some ex-servicemen have felt no difficulty at all in becoming civilians again; some of the men in great but secret distress would be furious if their problems were openly broached; and it is certain that a considerable number

* A paper read at the Northern and Midland Division of the Royal Medico-Psychological Association on 10 October, 1946, at Rubery Hill Hospital, Birmingham.

will never consult a doctor because of fear of impending insanity. So both the size of the problem and the exact shape of the curve of its intensity are difficult to assess. Some relevant facts are known, of course. Surveys of ex-prisoners of war suggest that 60-70 per cent. have experienced greater or lesser distress and difficulty in industrial, domestic or social fields. Many hundreds of these men have been treated in psychiatric hospitals, not for illness which appeared during imprisonment, but for psychiatric disturbances consequent upon and arising only after repatriation. Many thousands of prisoner repatriates accepted the offer of help at the Civil Resettlement Units, which were designed after a study of the problem by psychiatrists and psychologists working in the Army. Scores of men are known who cancelled their acceptance of the offer because in their distress they could not face the prospect of discussing their problems with anybody at all.

Prisoner repatriates have been studied intensively and there is agreement by those who made this study that the basic problems they present are different *in no essential* from the problems presented by servicemen in general who have returned to home life after years in the Services. Civil Resettlement Units could not be created, however, for other than prisoners of war. Their numbers were too large, and in any case they do not arouse the same mixture of curiosity and compassion as was aroused by prisoner-repatriates. There is little public feeling now for the man leaving the Services. He may once have been treated by the public with propitiatory fêtes and rites, like a sacred sacrificial animal, but naturally, now that the war is over, he is an anachronism, and any difficulties he may have in becoming a civilian he must handle as best he can, with few social agencies to help him. An estimate of the numbers who have not made a good adjustment must be a guess—a sample survey of non-prisoner repatriates suggests that a quarter are as unsettled as the most unsettled prisoners of war—certainly the majority will never come for medical diagnosis, and they must be regarded as a sociological as well as a medical problem, an incubus on the mental health of the nation. Without pressing for too close an identification of the prisoners of war with other repatriates, it would be wise to take seriously the figures reached from the study of the former problem. We may be sure at least that the numbers we see in our consulting-rooms represent a few men self-selected from the mass which either hides its troubles or endeavours to cope with them in other ways.

Before we can discuss the feelings these men have and the different syndromes into which these may fashion themselves, we must recognize that repatriation itself is a stress at once peculiar, subtle and unexpected. A glance at myth and history will show us, however, that it is not a new phenomenon. Let me quote one case-history from literature :

When Ulysses was away on overseas service he resisted the wiles of foreign women and thought often of his homeland, the beautiful Ithaca, and of his wife who lived there. Penelope was fighting a different, nearly a losing, battle against the temptations of her aspirant suitors, and when her service husband demobilized himself he was just in time to prevent the complete break-up of his home. When he returned from his combined operations he found that things were far from well. Much had changed. His own son did not recognize

him, and his own servants regarded him as a stranger in his own land ; and it is interesting to note the hesitancy and caution with which he handled the situation facing him. He sought no effusive welcome, but disguised himself as a shepherd, and going to a trusted farm hand who knew him as a child, re-established a relationship there. Only when he was sure that the old man retained his affection for his master did he say who he was, and begin the painful process of rehabilitation. He approached his house in a mixture of anger, curiosity and doubt, and was laughed at by his wife's suitors and mocked by his own maids. He was eager to be loved by his wife, not as a hero, but for his own sake, and he entered his home beset by rage, suspicion and uncertainty.

The case-history goes on to say how his irritation at the immoral women in his home community grew and expressed itself, and how he took his revenge on those civilians who had been eating up his birthright, how he was reunited with his war-weary wife and his worried old father, and how he re-orientated himself in honour and affection. This psychiatric social history ends there, and Homer does not go on to tell us of any subsequent difficulties of industrial or domestic adjustment needing after-care. We must imagine these for ourselves. We know that Penelope and Ulysses were fairly stable individuals, but I cannot imagine that their home was without domestic scenes until their mutual emotional readjustment was complete. At all events, on the evening of V.J.-Day I seemed to hear a continuation of the story. I heard a woman behind me in the crowd gossiping about a more recently demobilized commando—"Two and a half years ! Back only a fortnight and she doesn't know what to do with him. He sits in the back room by himself. Won't speak to anybody, won't go out, won't read. Won't do nothing. She doesn't know what to do. There'll be trouble there."

A second case-history is that of a man seen earlier this year. In 1939 at the age of 18½ he joined the Army, and in 1940 went to the Middle East with an armoured unit. Three times in the next three years his unit got to the salt flats of El Ageila, and twice it was driven back. During this time his home and his father and mother were destroyed by bombs. He lived, mainly in the sand and sun, a life full of thrills but little day-to-day interest, with the compensations of tight comradeship and freedom from responsibility for the major decisions of the day. During these three years he had two leaves in Cairo and spent £200 in two weeks in hotels, cabarets and brothels. He returned to his own land last year and immediately fell into difficulties. Though a young man of 25 he had never been in an English pub, and panicked on the two occasions he had tried to ask for a drink. He felt awkward because he did not know what behaviour was normal in any social situation and felt that he was a foreigner, liable to be looked at and laughed at. Any public places—a café, a railway station, a dance hall, a bus—brought up problems of behaviour and common convention which made him feel inferior and ignorant. How to behave as a visitor in somebody else's home puzzled and worried him, and he was afraid of young women, diffident and uncertain how to address them, unsure of the proper approach, and unable to decide whether women were Madonnas or harlots. It was difficult for him to think that they might just be human beings like himself. So, unsure of himself, somewhat

lost and bewildered, and unable to feel settled and at home in his own city, his sleep was disturbed and he became morose, angry with civilization, bitter about the lack of comradeship in civilian life, quiet, asocial and depressed. He wanted to rejoin the Army or join the Palestine Police Force or to emigrate, but felt too ill because of recurrent nightmares even to take up simple work. When he was seen he had spent all his gratuity in a vain search for enjoyment, and had come to the end of his tether.

The third case-history concerns a prisoner of war, a regular soldier, now 26 years old. He had been brought up in a slum home, from which he escaped into the Army in an endeavour to lead a decent, clean, orderly life. He enjoyed the discipline, the regularity of pay and food; and began to respect himself. He seriously hoped to reform his widowed mother, who disgraced him even before his slum neighbours by drinking too much. The war broke out when he was abroad. His great pride in his unit for its subsequent fighting record suffered a terrible blow when he and it were captured at Tobruk. He was then subjected to the dirt and disorganization of Italian prison camps and had to fight for his food with other men who, too, had once known civilized manners. When placed with Indians in Salonika he endeavoured to uphold his own high standards of behaviour and refused to take part in the scramble for garbage, feeling contaminated by and guilty about the primitive savagery of the struggle for existence. When he was transferred to Germany he joined in the ordered intensely democratic life of a German prison camp and settled usefully, but lived for the day when he would be released—Britain would be fine; the people there were decent and homely and clean; there was freedom in Britain, and comradeship and honesty. In his need for affection he often dreamed of his mother, whom he saw as a clean, thrifty Scotswoman, and made all kinds of excuses to himself about why she had never written to him. He had fantasies about his home-coming, felt sure it would resolve all his hopings, and planned to attend night school and become a wireless engineer.

On repatriation he went back to his home street and found a stranger in his home. His mother had moved, and he found her living in one dirty slum room. He was shortly the centre of a drunken civilian cheering party that he tried vainly to enjoy. He had to sleep on a mattress on the floor for a week or two and began to get angry at life; his fantasies had been destroyed and life faced him as it was—difficult, dirty and ill-organized, demanding further efforts of him. It was easy to exchange trivial commonplaces with people, but nobody understood how he felt. He resented sympathy, and felt fury at the bomb stories that defensive civilians thrust upon him. He could not understand how people could hold such empty values and knew that they could never understand his own. In despair he picked up several street women, and there, too, found disgust and despair at the emptiness of the relationship. He spent his gratuity in drink, went to London and slept in air-raid shelters, had violent feelings of destructiveness, and murderous wishes towards policemen—"Smug and happy as if nothing had happened." He was admitted to hospital, violent, suspicious, bitter about Britain, and scornful about any offers of help—"I've seen your sort before; you're trying to get my story so that you can laugh at me." He said he was a slum rat—"Let's have no

pretending—send me back to the filth where I belong.” He ground his teeth and clenched his fists constantly and hit viciously at doors and walls. A week later he was classified as schizophrenic.

These cases are perhaps too violent to be typical, and a fourth case-history is needed. A man of modest intelligence, well adjusted when he was a labourer before the war, was placed in the Pioneer Corps during the war years, and although he missed his wife at first, settled down to good work of a routine nature. He had comradeship and had no worries about money, food or a job. He got on well with his officers and his fellows and felt proud of his uniform. When he returned to civilian life he felt himself a stranger and was badly puzzled by regulations about food and clothing and shortages, and felt inferior in the presence of people who understood these things and handled them casually. Things were too much for him to understand, and he felt foolish and shy before the complexity of life. He kept to the house, could no longer take his wife to the cinema, and resented the fact that his wife was now managing his affairs, and was trying to get him a job, although he recognized that it was necessary for somebody to do this in the face of his own incapacity and lack of initiative. He developed headaches and indigestion and went to his doctor, but was too ashamed to confess his own puzzlement at the civilian world and quietly accepted the medicine which was given him, although he felt it would do him no good. “If only he had asked me what the real trouble was I might have told him, so I just told him about my stomach.”

Many more case-histories than these few are needed to indicate the wide range of clinical reactions to unsettlement. The mildest forms of industrial unsettlement may, however, be present in our own doorsteps, in those employees who have returned from the Services and cannot settle easily into their once familiar regime, who want to apply for other jobs, who are restless and dissatisfied with their careers, who drink more than they did, or who are quieter and less at ease than they were. The most severe disturbances at the social and domestic levels are revealed in the public courts, in the separation orders, in the charges of attempted suicide or murder, or child neglect, and in the Juvenile Courts, where children from a disturbed domestic scene show the social forms of their distress.

There is a general belief that widespread unsettlement is an inevitable consequence of war itself, and that it occurs as a result of human aggression unleashed in wartime, and that the spontaneous individual feelings of peace and co-operation are bound to lag behind the official declaration of V-day. The fear has been expressed that men trained in warfare do not forget their training, in spite of the fact that servicemen are not trained to kill each other, but rather to live together even under privations in loyalty and comradeship. (It is true, of course, that numerous individual clinical problems of aggressiveness and despair are the result of the exhibition of aggression in wartime. One meets violently irritable ex-servicemen with nightmares which began after bloody episodes, and quiet men hiding their mourning for dead comrades from themselves and the world, but these are truly problems of service life, not problems of ex-service stresses.) A glance at one or two other phenomena will show us that the same troubles with which we have so far concerned

ourselves can arise without war, and are implicit rather in any sudden transfer of an individual from one cultural framework to another with which he is unfamiliar or out of touch. They seem to arise whenever people are uprooted from a familiar social environment.

A paper written in 1940 drew attention to a disturbance of emotion severe enough to be called "evacuation psychosis." It arose in old men and women evacuated from their homes to bomb-free areas in the country, and was characterized by depression, apathy and confusion.

In 1944 Lord Rennell, Director of U.N.R.R.A. in Italy, concluded that the greatest handicap in resettling the Italian refugees from the battlefields was neither hunger, malnutrition nor physical disease, but a peculiar distress at being uprooted, which showed itself in irresponsibility, dependency, resentment and apathy. This resulted in carelessness about infestation and personal hygiene, and a serious lowering of the standard of their personal morals and habits of hygiene. Their lack of respect for the latrine was by no means characteristic of them as Italians, but rather as newly displaced persons.

A similar phenomenon was observed in Britain in 1940 when the correspondence columns of our newspapers aired widespread complaints from those who had given hospitality to evacuated children, and found them to befoul carpets and stairways, to be careless of property, rebellious, rude and delinquent. Not realizing that these disorders of behaviour were reactions to the distress of domestic disruption, some correspondents assumed that it was a normal state of affairs among working-class British children and expressed their indignation at the failure of compulsory education, and revived the old remark that the only visible effects of the Education Acts on Britain was that the writing on lavatory walls was now two feet lower than of yore.

Before the war began some of us were familiar with similar phenomena in another setting. Well-meaning city planners condemned the filthy and dilapidated houses of slum dwellers and installed them in clean, well-laid-out housing estates far from the homely, closely integrated communities they once knew. This planned social disruption produced among some of the people so displaced a loneliness and confused distress and a dissatisfaction with their new strange society that expressed itself in poor standards of conduct. Stupid destructive and careless behaviour was reported in the new homes, and the occasional appearance of coals in the bath produced an interest and shocked indignation hitherto reserved only for brides and blood in the bath, or actresses in baths of asses' milk, or chorus girls in baths of champagne.

We may recall, too, the behaviour of some of the Jewish refugees in this country before they had found an accepted place in our society. Their demanding dependency on benevolent organizations, their social immorality, their hungry self-seeking, their touchiness and their lack of gratitude, provided yet another* example of the behaviour disturbances consequent on the transfer of human beings from one social milieu to another, and of the kind of problem that may irritate authorities who procure and manage such changes on a

* "By the rivers of Babylon, there we sat down, yea, we wept, when we remembered Zion . . . and them that wasted us required of us mirth. . . . How shall we sing the Lord's song in a strange land?"

mechanical basis and in all good faith, but in ignorance of the psychological facts of life.

Sociological studies of the integration of foreign national groups and coloured communities into second generation societies throw a good deal of light upon the difficulties presented to society by immigrants and strangers, but it is sufficient if the examples given help us to understand that the psychological problems arising in ex-servicemen to-day are not specific to our generation or circumstances, and that they are in line with similar problems which face human beings from time to time—whenever they are required to grow satisfying social bonds in a new social milieu.

Many a returning serviceman knew that he had new viewpoints and ideas, and some were and are eager to practise their expression in civilian life, but few had any but a superficial understanding of the emotional strengths and weaknesses that service life has given them. Most men knew that they had a lot to learn, but few were prepared for problems of emotional adjustment in their very homes, and their own workplaces, and among their own familiar communities. In fantasy their civilian life was to be as they left it, with no closing of the emotional ranks when they fell out, and they felt themselves to be basically unchanged. The great barriers of unshared experience that grew up in the war years between them and their familiars in civilian life were and could only be half-realized. The blessing of freedom carries many burdens, and the feeling of these burdens had been forgotten.

The emotional deprivations of service life meant that many men, hungry for home, turned to phantasy and saw civil life through rose-coloured spectacles. Comfort, freedom, tolerance, affection, independence lay there. It was forgotten all too often that wives are not always obedient, loving, good-tempered and dressed in their best clothes, and it was not realized that a warm fire, an armchair, a book (and no bullying sergeants) become boring after three or four hours. Friends are forgetful and may have grown new interests and other ties, and old familiar places are oddly unexciting and unsatisfying. It is both puzzling and disconcerting that the feeling of belonging at home which has been so often wanted can be so elusive, and that the old familiar places should feel so new. The feeling of strangeness, the growing fear of not now being able to grasp the prizes of old feelings and situations, the anxiety that after all it can never be the same are forceful disappointments. A fear of meeting friends in case of failure, an inability to sense atmosphere in old places, and a feeling of emotional isolation from the relatively lawless and selfish civilian life is a terrible tragedy after years of longing. The difficulties are often about intangible and incommunicable deep human values, and the inability of others, wives and friends, to share a subtle but important viewpoint makes for distress and growing anger and a belief that they have forgotten what life is about. Men in such a state are restless, bitter and irritable at home, and feeling cut off from the very sources of understanding affection go for long solitary walks or remain silent and morose for long periods. Alcohol is a commonly sought relief, and may help a man to talk to strangers without uneasiness, but sober mixing with crowds and inactivity at home are alike intolerable.

Coincident with this uneasiness the practical details of a new life must be settled. Work must be found and kept. Who will have him? What is he fitted for? The competition of his fellows is something new again after the common tasks and comradeship and assured pay of the services. Unknown workmates are felt to be potential enemies. Those who prospered in war and have secure homes may be hated.

If these feelings are aired any failure on the part of his family to understand them may meet with fury and a hopeless despair at ever being understood. Family rows may become frequent, and the ex-serviceman has a common habit, distressing to his relatives, of slamming the front door and going off in a rage to walk it off.

It would be wrong even in a rapid survey like this to pretend that the ex-servicemen's home had no wartime problems. Wives, too, were lonely, and grew an independence and freedom of thought that may be unwelcome to their returned husbands, but which they are not always prepared to relinquish. In turn they may have longed for the return of their husbands, and be eager to lay upon these unfitted men the burdens carried alone for so long. A wife may have new tastes, new enthusiasms, unfamiliar viewpoints, and in turn may be hurt and angry that she, too, is not understood and accepted in the old way. Arguments, rows, violence in the home, hopeless impotent rage may follow the thwarting of the repatriate and his wife in their need to regain the homely understanding they so often cherished and yearned for in the past. These outbursts of anger are followed invariably by shocked repentance, and then the whole cycle may begin again on a basis of bitter despair at ever regaining emotional security.

It is not surprising that the uncertainty of being loved and acceptable reflects itself fairly commonly in absolute or relative impotence. This may be transient, and where the wife's attitude is one of tolerance and affection a good prognosis can be given. But the emotional splits between man and wife are often too embarrassing to both for help to be sought, and many decent people suffer the distresses of rows, violence and sexual estrangement in shame and unhappiness.

Emotional unsettlement reflects itself in industry in various ways. The newly assumed domestic responsibility and the high cost of living may make for an unreasoning pursuit of high wages. Hostility and rivalry, jealousy and antagonism for workmates may all be expressed in this way. Common industrial signs of unsettlement vary from withdrawal from communal life of the factory to indiscipline, arguments with foremen, and failure to participate in the leisure activity of workmates. A restlessness, an inability to feel settled and unreasoning dissatisfaction with wages make some men go, anxious and hostile, from one job to another, while others develop feelings of exhaustion at work, and show their distress in common conversion symptoms.

The common feelings of irritability, hostility, bitterness and failure to feel at ease in old surroundings pursue many repatriates in their social lives also. Some men will get up and leave their house if a stranger comes in. Many will go to great lengths to avoid meeting acquaintances and use the back door only, or go out only at night, but the need to be understood may lead some to

public-houses, there to drink in solitary gloom, wishing for the courage to talk to others. The failure to make effective human relationships may be seen further in broken engagements, failure to maintain old friendships, refusal to renew memberships of clubs and societies, or in the ganging-up of ex-comrades.

It is common to hear from these men of the fear of going into public places, an embarrassment at going to church, the cinema, the dog-track, and of difficulty in joking and feeling at ease in company. Among unmarried servicemen contacts with women of their own kind, friendship, affection and marriage may have been a deferred delight, a phantasy elaborated during service life whenever the unsatisfied needs for tender relationship were felt. Now, sheer ignorance of womankind may make for awkwardness and shyness and fear of the very people who were worshipped from afar. Violent feelings may be noted—a belief that women should conform to his fantasies of perfection in understanding and friendliness in their recognition of his needs, in public conduct and in private conversation. The fact that women are ordinary human beings, now wise, now foolish, often tactless, often without intuition, may be felt by him to be a wicked infuriating failure on their part. Again, the feeling of being cheated of a thing he felt sure he was to get may give rise to angry desire to destroy all womenkind as monsters, cocottes, harlots, drunkards, foolish empty-headed hard-boiled gold diggers. So his approach may vary from inability to speak in their presence and a shy avoidance of women in general to a despairing attempt to achieve ultimate relationships with prostitutes and brash attempts at affectionless seduction, with violence if his advances are spurned. Many men who have got as far as escorting a girl home from a dance are in terror when it comes to say good-bye. What is the proper thing to do? Can he kiss her? If he tries and fails he may feel again anger and foolishness. If he succeeds he may be no better off. Has he to go further? Will she think him slow if he does not? What is the correct thing to do?

In general, the distress at being a stranger in his own land and at failing to settle gives rise to a feeling of angry emptiness, and the situation is felt to be worse because the security of service life and the support of comrades are no longer present. He must deal with his anger and his emptiness by himself. Withdrawal of interest from the world as a protection against further hurts may lead to actionless apathy, but all the mental mechanisms used by mankind as protections against intolerable anguish may be seen in the worst cases. Paranoid beliefs about the rottenness of civilians, women, friends, employers, politicians may produce minor disturbances of behaviour, or may flower into psychotic states. Bursts of uncontrollable aggression at near relatives, people, or at a world felt to have failed him after his years of effort may lead some men to the police-court.

Depression of varying depth with feelings of failure and uselessness or with bitter paranoid colouring is perhaps the commonest resultant of severe resettlement difficulties, with suicide as a possibility.

Anxiety states too are common, especially with phobic developments of closed spaces, of cinemas, of crowds; or accompanied by somatic complaints—

breathlessness, headache, fatigue, indigestion. Hysterical conversions occur also, as might be expected, but in my experience they are not common.

Case-histories of unsettlement are typical. Relatives will almost monotonously give the same story: "He was all right the first few days; he was so glad to get home, but he seems changed. He used to be so cheerful. Now I don't know what to do with him. Nothing I do seems right for him. He's a different man." Almost invariably moodiness, outbursts of temper on small provocation, refusal to meet friends, narrowing of social interests and blunted industrial confidence, desire for solitude, restless inability to settle and a new tendency to take long walks precede the grosser clinical states.

This is not the occasion to discuss the treatment and handling of these men, but two warnings are relevant. Many of them have in the past come face to face with loneliness, death, destruction and horror. Their experiences will often have given them a conviction that they know more about life than civilians. The contrasting confidence of civilians often therefore irritates them, and leads them to feel that they can never be understood. The civilians are felt to be wrong and queer. On this account advice to a man to make an effort to pull himself together will meet with quiet hopeless contempt for his adviser.

Secondly, sympathy shocks and hurts, for it sets them apart as "different." Almost universally they have compelling needs to feel integrated again with their own people, and in any case do not feel it is they who have changed. They need understanding and recognition of their distress on an adult basis, as a settlement problem, and all but the very sick are angry or frightened at the idea that they may have a neurotic illness.

Their problems are largely those attendant on a change of social setting, problems of ego development and modification, and of social re-expansion. We would be wise to recognize that our pre-war and wartime experiences do not wholly befit us to understand or treat them. Only a determination to grasp the emotional problems inherent in change of community will enable us to bring therapeutic interest and understanding to this wide and important social problem.

DIVERSIONAL THERAPY AT BROADMOOR CRIMINAL LUNATIC ASYLUM.

By J. S. KNOX, M.R.C.S., L.R.C.P., D.P.M.,

Deputy Medical Superintendent, Broadmoor Criminal Lunatic Asylum.

SOME 640 men and 170 women patients are detained in Broadmoor. The following account of the diversional therapy applied to their different types of mental disorder may be of interest.

The effect on our closed community is to brighten the monotonous lives of the patients. The games and similar activities stimulate interest, initiative, and a readiness to accept responsibility.

The Medical Superintendent and the Chaplain are assisted in this work by a committee of patients annually elected to represent the views of their respective blocks. This central committee appoints sub-committees to control each undertaking.

Different types of entertainment are required in order to give as many patients as possible an interest in this form of therapy. Outdoor games such as cricket, bowls, football, throwball, softball, croquet, quoits and lawn tennis are provided. In addition there are annual sports and a flower show. Indoors, table-tennis, the annual concert party, the choral society, lectures, dances, the cinema and whist-drives provide entertainment in the Central Hall. A monthly magazine is issued. Cards, draughts and chess are played at all times in the wards, and individual hobbies are promoted as far as is possible.

Some of the above attract patients who are skilled at ball games, some require intellectual ability, and others appeal to individuals who are not particularly good at anything. Some recreations are useful because they draw large audiences of patients. Others again appeal to the outside public, and thus provide important extra-mural contacts enabling neighbouring teams to visit the hospital, and audiences, often containing patients' relatives, to attend the various concerts.

Cricket at Broadmoor has been under the successful control of the Chaplain and his predecessors for the past 70 years. The attractive bowl-shaped ground is partly surrounded by an orchard, and partly by a tree and flower-covered hill. Between 70 and 90 patients of different types attend weekly and watch the matches. On the field they have a picnic tea, and the occasion provides opportunities for men from different parts of the hospital to meet and talk to one another. The first team has at least 4 patients playing, and the umpire, groundsman and other officials of the game are also patients. Besides these week-end matches, which are against good club sides, there are internal games

played mid-week in which, during the season, about 50 patients take an active part. Many are convalescent patients or mild manic-depressives and schizophrenics, with some feeble-minded persons. Few have ever played the game before, but some are able to learn and become creditable and enthusiastic performers. Very few excel at batting, but a number are accurate and skilful bowlers and good fieldsmen. In peace time a proportion of our matches are played away, which gives the patients taking part a desirable change of scene.

There are four rinks for playing *Bowls*. They are kept in excellent order by patient-labour, and the game is, like cricket, played in the summer months. The greens are situated on a high terrace backed by the buildings, and overlooking a view of some 30 miles of open country. About 25 patients are considered good enough to play in the games arranged with neighbouring teams. Their ages vary from 20 to 65, and among them are convalescent patients, manic-depressives, paranoiacs, and feeble-minded persons. At various times 100 patients take part in the internal matches and competitions which are played during every fine summer afternoon or evening. Among the staff are a dozen keen and good bowls players. They coach the patients, and successful results against local opponents are recorded. The game is organized by the patients' bowling sub-committee, which is responsible for selecting the teams and arranging the internal competitions. Prizes are awarded, and the competitors are handicapped so that every player has an opportunity to gain a prize. There is no monopoly among the better players.

Association Football is played from October to the end of January. Fifty patients join in the games, and large numbers attend and watch. As the standard of play is low, the first team is generally strengthened by the addition of two or three male nurses, and teams of secondary school boys or from the lower divisions of local leagues provide the opposition. As these games have to be played at home we are unable to enter competitive football.

Throwball was invented and developed here in the days when football was considered too dangerous a game for our patients. It is played with an Association football, but the patients run with it in their hands and try to throw it into a small goal. Handling an opponent is not permitted—a condition which makes it possible for the middle-aged men to play. It is a good fast game played on a small grass pitch 80 yards long by 40 yards wide for a period of 40 minutes. This enables two matches to take place during a spring afternoon, when this game is played. It attracts a large and enthusiastic following.

Softball is an American game founded upon the principles of baseball. It is exciting, fast and sufficiently simple to be understood and enjoyed by many of the refractory patients. It is organized by a specially selected patient, who is in charge of all the games held in the refractory blocks. He arranges matches in the exercise grounds, and also on Sundays in the summer on the cricket field. Out of 130 refractory patients some 20 take part—among them are paranoids, manics, melancholics, low grade feeble-minded, and those with organic brain disease. About 30 other persons are able to attend and enjoy the comparative freedom of the cricket ground.

Croquet is played by the women patients throughout the summer months, and competitions are arranged by their own committee.

Outdoor Quoits is very popular among the men, and many show great skill at this game.

Lawn Tennis is played upon the one hard court provided by the Institution. It is unorganized, and dependent upon individual effort for its life. It has its enthusiasts, however, and not many summer evenings pass when it is not in use.

The *Annual Sports* are carefully organized. Every patient is handicapped in accordance with his previous "form" in such a way that he must make a special effort if he wishes to win. All ages and tastes are catered for, and the more orthodox events such as the 100 yards are mixed with others such as basket balancing, slow bicycling, etc. A quoit competition tests the skill of the older men. Cigarette prizes reward the successful competitors in the side-shows, and the day ends with nearly everyone obtaining a prize of some sort. The whole event is organized by the patients' committee, and the course officials and stewards are also patients. Only the starter and judges are selected from the staff.

Our district is a rural one, and gardeners are good and many in number. One hundred male and 18 female patients have plots of ground of their own. On these they produce fruit, flowers and vegetables. These they either eat, sell, or give away, and many of them grow for exhibition in our annual flower show which is held in the Central Hall, where good staging arrangements are provided, and displays are of quite a high standard. At the same time painting, modelling, sewing, fancy work and knitting are exhibited, as well as a large stall with goods to sell for charitable purposes. Side-shows in the charge of patients are provided, and all day long patients, and in the evening, many of the local public view the exhibits and purchase many of the articles. The profits are sent to a prescribed charity which is, on occasion, the Benevolent Fund that helps the indigent patients.

Of the indoor diversions *Table Tennis* is very popular and is arranged in "Clubs," each of which draws its membership from a prescribed part of the Institution. During the whole of the winter "leagues" and individual matches take place on three or more evenings a week. Once a month games are arranged between the best patients' team and visitors from neighbouring towns, and the standard of play is sufficiently high to attract a large number of patients as spectators. The umpire is selected from the staff and the scorer and ball-boys from the patients. As this game requires both nimbleness of mind and of body the numbers who are efficient is limited. The best players are mostly convalescent patients, mild manic-depressives and some paranoiacs. During the dark evenings it gives entertainment to about 70 men and 30 women.

The *Concert Party* called the "Broadhumorists" consists of about 25 selected male and female patients. Others serve as dressers, scene-shifters and the like. On two evenings a week in the winter months a stage-play written by a patient is rehearsed. These meetings are looked upon as social occasions and have therapeutic value, and considerable perfection is thereby attained without staleness. The production takes place in March and April, with three performances to different classes of patients and twelve to the public. Over 3,000 people attend. The dresses are made in the Institution's shops and are

a special and very attractive feature. The scenery is painted in the upholsterer's shop by a patient under the skilled supervision of the Master. He and his patients control all back-stage operations. The music is directed by a male nurse who is a musician, and the Institution's band forms the orchestra. The Medical Superintendent personally controls the production. It is mainly the convalescent and manic-depressive patients who take part in this form of entertainment, and is valuable because it helps to reduce the local prejudice against mental illness in general and Broadmoor in particular. It also has found us friends in many fields who have been able to help us in a variety of ways. Thirdly, it has enabled the patients to collect over £300 annually for charity. In addition to the above a smaller party visits some of the surrounding villages and gives a specially rehearsed concert during the winter months.

The *Choral Society* is a particularly worth-while entertainment. It is organized by a musical member of the staff, and caters for many patients who seem to have little other interest. The number of performers is 50, the women providing the more skilled half. Many of the patients are frank psychotics, and often depressed, deluded, irritable and difficult in daily life, but are responsive and obedient to the conductor and sing correctly and well. They rehearse in the Central Hall on two evenings a week during the summer months and give four performances to the patients and to local audiences. Among these patients are some who are capable musicians and have good voices. The standard of their performance is, for an amateur production, quite good.

An *Evening Lecture* is arranged once a month in the winter and is given by an experienced lecturer on travel, scientific, political, or other subject of general interest. About 300 patients attend, and interesting discussions generally take place. There is a good deal of musical talent in the district, and musicians, concert parties and choral societies also give freely of their services to the patients. These performances are much appreciated.

Evening Dances are held four times a year on a somewhat elaborate scale. The Hall is decorated skilfully by the Matron and her assistants. The women wear their best frocks and many appear in evening dress, while the men put on their best suits. Eighty male parole patients attend, with a rather smaller number of women patients. The Medical Superintendent and the Medical Staff with their wives are present and dancing goes on from six to eleven, with two intervals for refreshments.

The *Cinema* is shown once a week during the autumn, winter and spring. On Friday evenings there are two houses, at each of which 200 of the better patients attend. On Thursdays performances are given in the refractory wards and 130 of this class of patient are present, so that nearly three-quarters of the population of Broadmoor goes to the films. The projector in use is a 16 mm. Gebescope, and the films are non-inflammable. Educational and feature films alternate, and both are very popular.

Four major *Whist Drives* are arranged for players of both sexes during the winter months. Smaller drives are also organized for the separate blocks.

"*The Broadmoor Chronicle*" appears once a month. A patient is Editor, and the editorial committee consists entirely of patient members who are interested in this kind of work. The whole life of the hospital is covered as far as

possible with critical and factual articles. There is a monthly "leader," with competitions, descriptions of entertainment and sport, jokes on topical and local subjects, cartoons depicting Broadmoor's eccentricities and peculiarities, poems, and advertisements from local tradesmen. Production costs are covered by the sale of copies to patients, their friends, and members of the staff. The magazine is popular, as it enables the patients to express their many and differing points of view to the administration.

These activities have considerable therapeutic value. They are indirectly paid for by the patients from the institution canteen without calling for assistance from public funds.

Finally, I would add that these observations are published by permission of the Home Office, but do not necessarily represent official views.

THE DIFFERENTIAL DIAGNOSIS OF A CONSCIOUS TEMPORARY GENERALIZED MOTOR PARALYSIS.

By G. DE M. RUDOLF, M.R.C.P., D.P.H., D.P.M.,

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THE conscious involuntary immobility of which recognition has been described elsewhere (Rudolf, 1946*a*) appears to be a cataleptic or trance-like state. The psychological aspects have also been described (Rudolf, 1946*b*).

Usually, except when undergoing an attack for the first time, no alarm or anxiety is felt as the subject realizes that the attack will persist for a brief period and that he will not remain paralysed. Occasionally fear is felt in every attack, as in the case of a female nurse who had suffered from three attacks, in each of which marked anxiety was felt. This anxiety could, however, have been due to hallucinatory experiences as she thought on each occasion that the Sister was coming and the patients were calling to her. Although the nurse was unable to move, sleep may have occurred and the condition have been sleep hallucinosis.

Although sleep hallucinosis is commonly found occurring in narcoleptics, hypnagogic hallucinations, that is, hallucinations appreciated as the individual is falling asleep, occur in the normal person. A nurse relaxed in a chair and closed her eyes. She thought she heard her name called and that someone leant over her, but she was unable to see anything. Suddenly she was able to see and to move normally.

States of sustained immobility involving the whole voluntary musculature may be due to causes such as—

- (a) Voluntary concentration.
- (b) Fear.
- (c) Day-dreaming.
- (d) Vaso-vagal attacks.
- (e) Schizophrenia.
- (f) Post-encephalitic Parkinsonism.
- (g) Hysteria.
- (h) Epilepsy.
- (i) Sleep.
- (j) Sleep paralysis.
- (k) Cataplexy.
- (l) Narcolepsy.
- (m) Coma.
- (n) Concussion.
- (o) Shock.

(a) *Voluntary concentration*.—The immobility can be terminated whenever the subject desires. Immobility of this nature occurs whilst bird-watching, listening to a sermon, lecture or play, or in a soldier standing at attention.

(b) *Fear*.—Extreme fear may cause immobility: the subject is "rooted to the spot." The immobility is short-lived and awareness of the surroundings exists. An example is the case of the captain of a frigate who stood motionless on the bridge unable to give the order to reverse or stop the engines although his ship was travelling, bow-first, straight at the quay.

The essential difference between the immobility of fear and that of catalepsy is that, in the latter, fear does not exist unless the subject is frightened of the immobility itself. The attack begins without the presence of fear.

(c) *Day-dreaming*.—Whilst day-dreaming, an individual often appears to be in a cataleptic condition but his thoughts are far removed from his surroundings, of which he is oblivious. Usually he has control and can bring his mind back to his environment, and, in consequence, is able to move at any time he wishes.

An example of intense day-dreaming was described by Kinnier Wilson, who reported that the eyes became fixed on some object, the object became indistinct, and only by a strenuous effort could the subject cut short the attack. At times he felt unable to move any muscles; yet thought, "Oh! yes, I can move if I like." No strong emotion was present.

Although day-dreaming is usually accompanied by immobility, as well exemplified by Rodin's "The Thinker," movement may continue during it. For instance, men at printing machines were noticed to maintain the movement of their arms and hands automatically, although the movement was not required. These men later asked what had been said to them during the period in which they had been, apparently, completely unaware of having been addressed, although another man, who continued movement and failed to answer, was quite without knowledge that anyone had spoken to him. Men may continue to feed the machines normally, but may miss errors in pictures or type on as many as 100 consecutive sheets. One printer who suffered from a mild type of day-dreaming in which he felt dazed, omitted, on one occasion, to notice a mistake until it had appeared on about 500 sheets. Another man, who felt dazed in a similar way, stated that he was able to move and to see normally during the attacks. Such conditions border on the diagnosis of hysteria.

These conditions in printers appear similar to some occurring in radar operators who have been observed to continue to turn the goniometer, looking at the screen but not keeping on the target. One man was noticed to continue to turn, with the target on the tube, although consciously he had not seen the target. When spoken to, he immediately realized the presence of the target and continued normally.

Another type of case is exemplified by a radar operator who turned the wheel more and more slowly and finally stopped, although he was not asleep and the target was moving on the screen.

These examples of day-dreaming accompanied by automatic movement are dissimilar to the type of case in which the subject feels he is moving automatically, as if the movements of the limbs were unrelated to the mind. In

one such case hypno-analysis revealed that the sensation was due to fear, with amnesia, for seeing 25 years previously the automatons or robots in the film "Metropolis."

(d) *Vaso-vagal attacks*.—In addition to the immobility, numerous other symptoms are felt. Full consciousness is usually retained, a feeling of impending death is often present, and the heart's action may be abnormal in rate or rhythm. The colour changes, dyspnoea may appear, and sensations, sometimes indescribable, may begin the attack. The attack may last up to half-an-hour in length, but the sufferer may be tremulous and weak for several hours.

(e) *Schizophrenia*.—The schizophrenic may remain motionless and is usually aware of occurrences around him. For instance, Lazell reported that certain sentences of lectures which he gave to mute and stuporose cases were remembered by the patients months after they had recovered. Although the possibility exists that brief attacks of immobility occurring in schizophrenics could be due to catalepsy, a striking point of the temporary tonic motor paralysis discussed in this article is its occurrence in persons leading a normal, apparently healthy life.

(f) *Post-encephalitic states*.—Cases of this condition may remain motionless and are fully aware of events around, but, as in schizophrenia, the sufferers are not apparently normal, healthy individuals able to perform normal work.

(g) *Hysteria*.—Fugues, whether short or long, are usually purposive. They may occur in order to protect the conscious from unpleasant events, expected, occurring, or imaginary, but amnesia, whole or partial, is present for the period of the fugue. In the temporary tonic motor paralysis described here, full memory is retained for the events heard or seen during the attack.

(h) *Epilepsy*.—The *petit mal* attack may resemble, to the onlooker, a brief cataleptic episode. The sufferer remains motionless with a blank expressionless stare and may change colour. This last does not occur in catalepsy. To the subject, the attacks of the two conditions are vastly different. The subject of *petit mal* is wholly or partially unaware of his surroundings during the attack, and may be unaware that an attack has occurred. The subject of the tonic motor paralysis discussed here is fully aware of the presence of the immobility, and of the events occurring around him during the condition. The rare inhibitory epilepsy is confined to a portion of the body such as one half or one limb.

(i) *Sleep*.—In sleep the musculature is usually flaccid, although in some positions, such as in sleep when riding, the muscle tone of the trunk is maintained. The tone of the neck muscles is always diminished, and that of the eyelids reduced, if not absent. In the brief cataleptic condition now being discussed, the tone of the orbicularis oculis is maintained so that the eyes are open and gazing into the distance in a fixed stare. The subject is aware of his surroundings so far as hearing and vision are concerned, although only objects in the direct line of sight are included. In sleep, the subject is usually unaware of his environment unless some strong internal or external stimulus influences the dream-content. An instance is that of a nurse who was sitting in a chair when she imagined vividly a certain patient getting out of bed. She called out to stop him doing so, and woke up to find him sitting up in bed about to get out to come to her to find out what was worrying her.

(j) *Sleep paralysis*.—This paralysis can be predormital or postdormital. In the first, localized or generalized paralysis, of which the subject is aware, occurs before sleep; in the second, after awakening from sleep.

Predormital paralysis can, if accompanied by fear, waken the subject fully, so that attacks of this condition could resemble those of the temporary tonic motor paralysis here being dealt with, if the latter were accompanied by fear. But fear seldom accompanies the condition if the subject is unaware of its harmlessness. No anxiety is felt once the sufferer is accustomed to its occurrence.

Postdormital paralysis is exemplified by the instance of a nurse who fell asleep in her chair, letting her book fall. She heard the door open, saw the Superintendent come in and walk away again, but was completely unable to move. All movements returned simultaneously. Attacks of the cataleptic states discussed in this article occur when the subject has been known not to have been asleep and, perhaps, has been standing. Instances are of an officer standing on watch on the bridge of a cruiser, and of a nurse, standing turning over the pages of a report book.

Both pre- and postdormital paralysis show durations of seconds or minutes. The second may be abruptly terminated by the subject being touched.

(k) *Catalepsy*.—In this condition the sufferer hears all that occurs but, as all voluntary muscles are flaccid including the orbicularis oculis, does not see his environment. The attacks are usually produced by strong emotion, either pleasurable or the reverse. The subject sinks down and appears to be asleep.

(l) *Narcolepsy*.—The attack of narcolepsy produces all the appearances of sleep, and the subject is usually completely unaware of his surroundings during the attack. The attack may be brief, or may last a few hours.

(m) *Coma*.—The immobility of coma, whatever the cause, is generalized, the muscles are flaccid and other signs of organic trouble are usually present.

TABLE I.—*Attacks of Immobility.*

	Muscles flaccid.	Muscles tonic.	Appearance of sleep.	Awareness of surroundings.
Voluntary*	—	+	—	+
Fear	—	+	—	+
Catalepsy	—	+	—	+
Vaso-vagal†	—	+	—	+
Schizophrenia	—	+	—	+
Post-encephalitic	—	+	—	+
Day-dreaming	—	+	—	—
Hysteria (fugue)	+	or	+-	++
<i>Petit mal</i>	+	or	+-	—
Sleep	+	—	+	—
Sleep paralysis	?	?	—	—
Catalepsy	+	—	+	Aural only
Narcolepsy	+	—	+	—
Coma	+	—	+-	— or partial
Convulsion	+	—	+	—
Shock	+	—	—	+-

+ = Present; — = Absent; +- = Variable; ? = Doubtful.

* Can be terminated voluntarily.

† Numerous accompanying symptoms.

‡ Not fully, after attack terminated.

Complete unconsciousness may be present, or some incidents taking place during the comatose state may be remembered.

(n) *Concussion*.—Again, the generalized immobility is of a flaccid nature, and complete unawareness of the surroundings is present. The unconsciousness may persist from one second to many hours.

(o) *Shock*.—The muscles are flaccid, awareness of the surroundings is present, except in severe cases, and the usual physical signs of the condition are found.

SUMMARY.

Sixteen causes of generalized immobility of the voluntary musculature have been discussed in order to provide comparisons with the temporary tonic generalized motor paralysis previously described.

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THE PSYCHIATRIC SOCIAL WORKER IN THE COMMUNITY.*

By E. M. GOLDBERG.

INTRODUCTION.

As you probably know, in January, 1944, the Provisional National Council for Mental Health were asked by the Board of Control to provide a Social After-Care Service for men and women discharged from Service Psychiatric Hospitals. For the purposes of this work an experienced psychiatric social worker, known as Regional After-Care Officer, was appointed to each of the Civil Defence Regions to undertake and organize this service. The psychiatric social workers visited the Psychiatric Service Hospitals in their areas, obtaining a full history and recommendations from the psychiatrist referring the case, and interviewing each patient to discuss his needs and plans. These reports were then sent to the Regional After-Care Officer in the patient's home area and formed the basis of our work.

Soon cases began pouring in, not only from Service Hospitals but from other agencies interested in the resettlement of the psychiatrically disabled Ex-Service man, such as Disablement Resettlement Officers, Ministry of Pensions doctors, Red Cross workers and so on. By the end of 1946 some 10,000 cases had been dealt with under this scheme.

Throughout we have been faced with an acute shortage of trained personnel and in most regions it was only possible to have the services of one or two full-time psychiatric social workers, so that most of the Regional After-Care Officer's assistants were trained social workers without the Mental Health Certificate. These general case workers receive a great deal of tuition and supervision from the psychiatric social worker. This dilution is raising great controversy, but it must be stated that some of the social workers have done remarkably patient casework of a high standard and that the scheme would have broken down without their help. As I will show later, emphasis on the general casework side is much greater than in orthodox clinic or hospital psychiatric social work, so that there is a place for the general case worker, under the guidance of a psychiatric social worker, in such a community service.

It is the first time that a community service on a national basis has been provided for a selected group of psychiatrically disabled persons and it has offered the psychiatric social worker enormous scope in applying her skill in the wider social field.

After three years of hectic activity, I felt the need to assess the value of this new service and its possibilities for the future, and began a study of successes and failures in our work.

* A paper read at the Social Psychiatry Section of the Royal Medico-Psychological Association at 11, Chandos Street, on 21 February, 1947.

METHOD OF RESEARCH.

I have been studying roughly 12 cases from each Region—chosen by the Regional After-Care Officers—six cases in which they felt that After Care had a positive contribution to make and where our work led to a general improvement, and six cases in which our work, intensive though it may have been, did not lead to any substantial change or resettlement. I hoped that by investigating the outstanding positive and negative manifestations of our work we might be able to elucidate essential trends. As I will show presently, definite trends in our work stand out quite clearly in spite of so many different personalities doing the case work with different types of training and background, and in spite of wide variations as to the type of population, provision of treatment facilities, standard of Social Agencies and so forth.

OUTLINE OF PAPER.

First of all I should like to discuss some of the outstanding characteristics of the success cases, both with regard to the type of patient and his disability and our methods of work, illustrating each group with one representative case. I will then analyze the outstanding failures in a similar way. From there I shall pass on to the social worker's essential role in this type of community care, touching on the difficult subject of the difference in the approach of social workers and psychiatric social workers. Finally, I am going to try to define in what way this type of psychiatric work in the community differs from the more orthodox psychiatric social work in the framework of a hospital or clinic, what its particular significance and contribution is for the present and for the future.

SUCCESSSES.

It is a common characteristic of all the success cases that the patients are co-operative; that is to say, they feel the need for help and have sufficient intelligence and emotional drive to want to get well and to establish a fruitful contact with the After-Care Officer. Often they are people whose basic personality and intelligence are reasonably good and whose disabilities are reactive rather than constitutional. But amongst the success cases there are also a number of very "poor fish," people of low intelligence, of almost constitutionally anxious temperament. They have, however, possibilities of emotional growth in them, enabling them to reach the worker and enabling the worker to establish a real contact with them. This contact proves the first bridge or link with the community and its demands and with infinite care these rather poorly endowed personalities can be helped to make an adjustment, as one After-Care Officer put it "within their shaky limits."

Four specific groups stand out clearly in every Region as capable of benefiting by After Care in the sense described above. They are:

- (1) Fairly acute anxiety states in persons of good intelligence and basic personality, often associated with a difficult reality situation.
- (2) Affective disorders, often almost indistinguishable from the chronic type of anxiety, in the rather limited individual who cannot

cope with stress and complexities and who needs the tolerant approach and patient encouragement, which will give him confidence to tackle life more successfully.

(3) The recovering schizophrenic, who needs rehabilitation in the widest sense of the word, from encouraging and stimulating contacts with reality in everyday home life, to re-learning the wider social skills in the community.

(4) Some cases of post-traumatic disabilities, who need skilled help to make a completely new adjustment on a new and often more limited level.

THE ACUTE REACTIVE ANXIETY STATE (Case example).

This man, aged 35, was referred for After Care by a Neurosis Centre in 1944, and has been an active case for two years now. He had always been a neurotic personality with depressive trends, but had a fair occupational and social adjustment prior to the War and many compensating positive qualities. He had an excellent record in the Army and developed a reactive anxiety state after acute experiences in the Norwegian campaign. His early home background was extremely unstable and unhappy. He married a mother-substitute type and has two children. At the time of referral he was separated from his wife and his domestic difficulties were severe. He was out of work and suffering from bouts of violent depression. An excellent contact was established and the patient proved to have considerable intelligence and insight. His marital difficulties were discussed freely and he was also able to release his guilt about some new attachment which has possibilities of emotional satisfaction. The man lives in a mining area, but is unable to carry on in heavy industry. It was found that he worked with great pleasure and skill on his allotment, which yielded remarkable results. After very careful consideration and consultation with D.R.Os. and psychiatrist it was felt that the best form of resettlement for this man would be to enable him to employ himself full time on his allotment, which could easily be extended into a smallholding. This would give him real satisfaction and also enable him to work at his own pace. As the agricultural resettlement grants were not in force then, a £50 loan was obtained from the Red Cross and the patient was helped to extend his activities. At the same time much practical help was given in sorting out various other difficulties with the Ministry of Pensions and Ministry of Labour regarding allowances for his wife. The patient was working under extremely difficult circumstances as the grant was not really big enough to live on. Constant encouragement and opportunities for discussing difficulties were given by the After-Care Worker. Recently it has been possible to secure the agricultural resettlement grant of £150. The patient has been able to repay the £50 to the Red Cross, has extended the smallholding further and is at last beginning to see a certain margin of profit. His nervous condition has improved greatly, and he has had no major attacks of anxiety or depression. As you will see from this account this man had treatment at a Neurosis Centre, but it is clear that no amount of psychiatric treatment alone would have helped him to a tolerable adjustment as the domestic and employment difficulties would have acted as continuous disturbers of the peace. The After-Care Officer was in a position to take into account this patient's varied needs. She brought him psychological relief through the talks about his marital and personal difficulties, by discovering the occupation that gave him every satisfaction, she enabled him to make this his life job. She relieved him of some of the domestic anxiety by acting as an interpreter to the Ministry of Pensions, the Assistance Board and various other Social Agencies. The P.S.W. was able to deal with the whole of the problem in its social setting. Through her co-ordinating function the other Social Agencies involved were helped to understand the complexity of this man's problems. The patient himself would not have been able to carry on through periods of severe financial and domestic stress if it had not been for the feeling of support and security which he derived from the After-Care Officer's understanding.

GENERAL.

It may be objected that this case relates to a patient who could and should have been helped by psychotherapy and that the social worker trespassed. It will have to be remembered, however, that psychotherapy is only available for very few people and that anxiety conditions which are closely bound up with difficulties in the reality situation often yield much more quickly to the combined approach of psychological understanding and practical help. It is obvious that by means of her training the Psychiatric Social Worker will be able to recognize when the condition becomes so severe as to demand psychiatric treatment. I have no time to quote a number of similar cases where the actual treatment part has been carried on at a Clinic, but where the After-Care Officer has played a vital part by attending to the material difficulties and needs of the patient, thus ensuring co-ordination.

AFFECTIVE DISORDERS AND CHRONIC ANXIETY STATES.

A man of about 38 was referred by a Neurosis Centre, where he was being treated after his discharge from the Merchant Navy, with a diagnosis of anxiety with depressive features. He had a cheerless and slummy home background, had seen severe enemy action, his wife had left him and he was living with his aged mother. He was able to take work as a labourer on his discharge, but became increasingly depressed, particularly as his new girl friend was cooling off. He again applied for treatment and had another spell at the Neurosis Centre, but his depression became so severe that he was considered a suicidal risk and transferred to a Mental Hospital as a voluntary patient. He did not stay there but came home, tried to work as a labourer, but remained irritable, depressed and suspicious. He could not adjust to life at home, which was undoubtedly partly due to the dreary and cheerless environment created by his very old and ineffectual mother and his slovenly and uninterested sister. The After-Care Officer obtained material aid and finally arranged for him to go back as a voluntary patient to the local Mental Hospital. He only stayed a few weeks and expressed his ardent desire to go back to sea. After intensive negotiations it was possible to arrange this. The After-Care Officer provided clothing for him and literally nursed him on to the ship. This was in May, 1946, and up till now he has been making regular trips to Germany, Portugal and Spain. He writes regularly to the After-Care Officer and asks her for help with innumerable practical difficulties.

You will notice that this man was in three different hospitals and that treatment failed to bring about any improvement, but that when he was given intensive personal attention and support it was possible to encourage him in such a way that he was able to go back to his old job at sea. Although he is still rather inclined to be depressed, he is probably as well as he has ever been. The After-Care Officer was, in this case, the only source of support and encouragement to a depressed and lonely soul, living in a cheerless, affectionless environment. His dependence on the worker was very great indeed at one stage and she was having to work very hard to fulfil his ever-growing demands, but he now seems able to stand a little more on his own feet.

GENERAL.

I should like you to observe that the unsparing intensive work on this and similar patients, who looked chronic and hopeless to begin with, was carried out by Social Workers, in contrast to the anxiety group which was handled

almost entirely by P.S.Ws. I feel that this is rather significant. The first group of patients needed a considerable amount of psychiatric assessment and the work of the P.S.W. amounted to something like superficial psychotherapy. In the second group of affective disorders, what was demanded of the worker was not so much interpretation of acute conflicts, but something which I should like to call "maternal care"—a form of positive support, material and psychological, making great demands on the Worker's willingness to give of herself unsparingly and this the less psychiatrically trained person seems well able to do. It strikes me that this group of depressed misfits in the community are people who have not had sufficient maternal love and instead of striking out aggressively like some of the psychopaths they have become depressed and ineffectual. Through the generous help of the Social Worker, who recognizes their deficiencies and who makes untiring efforts until positive feelings are stirred, the patient is able to move forward, at first utterly dependent on his new mother figure, but gradually emancipating himself as he is able to reach out for other satisfactions.

THE RECOVERING SCHIZOPHRENIC.

A boy of 19, with 18 months' service in the Army, was referred by a Military Hospital in May, 1945, the diagnosis being hebephrenic schizophrenia. The boy was the only son of a very over-protective mother. He was of superior intelligence, matriculated and was called up from school. He worked as a laboratory assistant in the R.A.M.C. When he was first visited he was still withdrawn and probably deluded and quite inaccessible. His mother felt that he was hopeless and by her attitude she was doing everything she could to keep him ill. The After-Care Officer visited regularly, won the confidence of the mother and was able to modify to a certain extent her attitude of over protection. She was encouraged to believe that the boy would improve and when there were signs that he was able to get into touch with reality she was taught how to encourage him and make the most of his recovery. In this way the boy was encouraged gradually to undertake more and more in the way of tasks at home and social activities outside, and when he was ready for work the After-Care Officer was able to find the one job he wanted to do, that of a junior chemist. He started this job about 10 months after his discharge from Hospital and he has gone from strength to strength since, as he is now also able to engage in social activities outside his work and his home. This boy probably made a spontaneous recovery from his severe schizophrenic illness, but I personally have no doubt that he would not have made anything like such a complete recovery had it not been for the help the After-Care Officer was able to give, first to his mother and secondly to him. This case shows what can be achieved by working through the environment first and changing the relatives' attitudes and by active help in the re-education of the recovering psychotic. There was a relationship of complete trust and confidence between the family and the After-Care Officer, who, with very good insight, made the right move at the right time, encouraging a gradual widening of interests and activities commensurate with the patient's capacities.

GENERAL.

The function of the After-Care Officer in this case did not so much involve the very intensive personal help the other group of patients required and was not so much dependent on transference and the relationship therapy, but was one of creating a social ladder, as it were, on which the patient was able to climb step by step towards social integration. It is a form of environmental help aimed at the patient, the possibilities of which have not, I think, been realized

fully. Here, I feel, lies a great field for experiment in psychiatric rehabilitation. I am inclined to think that many psychotics, after successful treatment, have a good chance of social integration if, at the optimum moment the right type of approach is made; if, in other words, the Psychiatric Social Worker is able to lay her finger on the one positive and real thing the patient is capable of achieving and that stirs his interest and imagination. I am afraid that we are still too stereotyped and unimaginative in our approach. Another essential point that emerges is the immense importance of following up quickly after discharge from Hospital, so that what I call the optimum moment is not missed. In civilian work we should be able to commence rehabilitation during the last stages of hospital treatment, and I have visions of rehabilitation centres following on occupational centres in the hospital and gradually leading towards everyday working conditions.

CEREBRAL TUMOUR PATIENT.

This patient is a married man, aged 37, who was referred in 1944 by a R.A.F. Station Hospital. He was said, at that time, to be anxious, depressed and retarded. He had a stable employment record, had reached the top class at his school and was apparently a stable personality. On the first home visit it was found that he was unable to carry out the simplest action on his own. He was immediately referred for psychiatric examination, admitted urgently to an E.M.S. Hospital and a tumour of the brain was found and operated on. He stayed in Hospital for 3 months and on his discharge he was expressionless, very slow, paralyzed completely down one side. He was attending as an out-patient the occupational therapy department of the Neurosis Centre. He was not receiving a pension and the financial situation in the home was very strained and required the After-Care Officer's attention. His speech was also impaired, and speech therapy had to be arranged, as well as elaborate arrangements for escorts. At that time the patient was very depressed and despondent and his wife, a rather neurotic type, was desperate, disgruntled and not encouraging patient at all. When the Neurosis Centre closed down, the last hope went as there was no occupational therapy available. The After-Care Officer was undaunted and after contacting many different agencies he was able to get a weaving loom for patient. He found an occupational therapist at the local Mental Hospital willing to go to patient's home and teach him once a week, and finally S.S.A.F.A. was willing to bear the out-of-pocket expenses of the occupational therapist. The loom was installed, the occupational therapist started to visit him weekly and the patient at last became active and hopeful. Finally, in order to provide a variety of interest, rug materials were obtained for him. The occupational therapist thinks highly of this man's ability and believes it is possible that he will eventually be able to do light work. Along with these practical developments went the After-Care Officer's close relationship with this patient's family. By providing outlets for the patient, relieving the intolerable financial strain and by general encouragement, he was able to lift a cloud of depression that had descended on the whole household, and outside people remarked how much more positive the wife's attitude was; instead of discouraging patient, she was now helping him and the last impression of the case was a write up describing patient sitting in a room with the sun pouring in, weaving happily.

This case, then, shows the Social Worker once more as a co-ordinator, seeing the patient's problems in his family setting. Occupational therapy alone would not have brought about improvement in the whole family outlook. Through the Social Worker's constant help, this man, severely disabled though he is, was enabled to use his limited capacity to the maximum, and both he and his wife have been helped towards a positive outlook.

POST-TRAUMATIC PATIENTS.

The main issue with the post-traumatic type of case is to help the patient to make a new and positive adjustment on a level often much lower than he had previously achieved, to guide the patient and his family towards the acceptance of the disability, at the same time providing positive satisfaction within the patient's range. The task of the P.S.W. is often a very complex one here, as she will have to enlist the help of many social and therapeutic agencies. She must be constantly aware of the possibility of the patient developing hysterical symptoms and other pathological reactions on top of his organic disability, if life is too difficult for him to face. No amount of training or occupational therapy or material help will bring about real readaptation if the fundamental problem of psychological readjustment remains untouched.

This brings us to the end of our analysis of the successes.

FAILURES.

They stand out remarkably clearly and fall into much more definite and uniform groups :

- (1) The allegedly uncertifiable unrecovered chronic psychotic, who, by virtue of his illness, is incapable of insight or of responding to our help.
- (2) The psychopathic personality, which I should like to divide into
 - (a) the delinquent psychopath,
 - (b) the unmanageable girl psychopath,
 - (c) the chronic alcoholic, and
 - (d) the paranoid type of psychopath, often subnormal in intelligence, who is frequently found in a derelict social setting.

THE UNRECOVERED PSYCHOTIC.

A single man of 30 was referred by a Military Hospital in 1944 with a diagnosis of schizophrenia, having made only a limited improvement and receiving a 100 per cent. pension. There was no previous history of mental illness, but he had an erratic employment record. The mother was immensely over-protective, and her severe deafness made it difficult to have much contact with her. The After-Care Officer kept in regular touch with this patient, visiting at intervals of a month or six weeks. He remained withdrawn and probably deluded. Attempts were made to interest him in work or occupations at home with no result. He was referred to the Ministry of Pensions three times with a view to further treatment and each time he was sent home again with a note saying that he only required panel doctor supervision, although latterly he had become increasingly more restless and deluded. The Panel Doctor was satisfied with the Ministry of Pensions verdict and no one moved until the patient proceeded to murder his father and severely injure his old mother. He was then committed to Broadmoor Asylum. Here, then, we have a patient who is considered a harmless lunatic, although he was actively deluded and deteriorating steadily. The price the community paid for the freedom of the individual was two lives, as the mother is incurably shattered by her experience, though not physically dead. The Social Worker's ability to help constructively was limited and could not amount to more than referring patient for treatment to the appropriate agencies and to giving all the help she could to a very over-protective, but kindly mother.

GENERAL.

It is evident that the function of the After-Care Officer in the case of the psychotic requiring treatment is to secure treatment, help relatives to cope with the patient and to co-operate with treatment. The serious situation prevailing all over the country is that the psychotic without insight will not consent to voluntary treatment and that some doctors and relieving officers are unwilling to resort to certification unless the patient is really a raving lunatic. This rigid limitation of the use of certifying machinery is alleged to protect the freedom of the individual. I wonder how long it will be until it is realized that the price we pay for the alleged liberty of an ill person, who would be much better in a hospital, is the life and happiness of otherwise normal and happy people. There is ample evidence that in all the Regions, After-Care Officers have left no stone unturned to get deteriorating psychotics into Hospital, but time and again they have met reluctance to certify and untold misery has resulted for the immediate environment of the patient, quite apart from the fact that the patient himself was not helped in any way. The reason for our failure in this type of case lies in the prevailing antiquated machinery of the Lunacy Laws, which, I hope, will be overhauled before long in the light of recent advances in the treatment of mental illnesses.

THE DELINQUENT PSYCHOPATH.

This man, married, aged about 30, was referred to us in 1944 by the Ministry of Labour as he had great difficulty in settling down to a job. He had been discharged from a Neurosis Hospital with a diagnosis of psychopathic personality with severe neurotic traits. His history revealed great emotional difficulties in early childhood, centring round a terrifying and over-powering mother. He went to a Grammar School, entered a Theological College against his will and finally joined the Indian Army. Whilst in India he married a half-caste twice his age, and married an English girl bigamously later on. After his prison sentence he had various commercial jobs. He was imprisoned on one occasion for impersonating an Army Officer. In 1939 he joined up again, was often absent without leave and was unable to keep his promotions. After his discharge from the Forces he had approximately eight jobs before being referred for After Care, and the reason for his dismissal from most of them was delinquent and/or arrogant behaviour. When he was seen first he was in the most severe financial and domestic difficulties, aware of his deep-seated problems, but blaming his circumstances for his repeated failures. An attempt was made to secure psychological treatment for him, but he did not keep the appointments. Finally, after intense emotional scenes, he left home and arrived penniless at the After-Care Office. He was then in a very co-operative mood and opened up considerably about his early difficulties, and there seemed to be a gleam of hope that one would be able to help him. He was fixed up in a hostel and, after great efforts, the After-Care Officer, in close co-operation with the D.R.O., succeeded in getting him a job as a valet in a Canadian Army Officer's Camp. This was a job after the man's own heart and he departed full of hope for the future. After a fortnight he was apprehended for stealing from the Officers and served a six months' prison sentence. A year or two later he was in further trouble with the Police after a shop-breaking charge, which took place after a severe domestic upheaval. Here, as in other cases, this patient's deep-seated difficulties go back to a series of emotional disturbances and conflicts in his early home life. He was intelligent and on the surface willing to co-operate, but his unconscious drives were far too strong, and even when some of the reality stresses were removed and he was given a completely new chance away from home, he was quite unable to lead a normal life; he also faces a life of prison sentences.

GENERAL.

Why are we so utterly unable to help these anti-social psychopaths, of whom many are above average intelligence, in spite of the fact that we have insight and sympathy with their problems? The fundamental reason probably is that their problems are so deep-seated and the pattern of delinquency so established that we are unable to break through to them. The establishment of any fruitful contact is made all the more difficult by their tendency to wander about the countryside. It seems fairly clear that this type of psychopath needs long-term treatment. One psychiatrist suggested that they would need some type of institutional treatment, which was a blend of a hospital and a prison, but even with long-term intensive psychotherapy one wonders whether any results will be achieved. I think it is important to bear in mind that in all these cases manifestations of disturbances and pathological attitudes were observed in childhood. Perhaps the only answer to this great problem is that by ample child-guidance facilities and wiser parent education we shall limit the number of anti-social psychopaths. (I will leave it to you to discuss this vexing problem further.)

THE UNMANAGEABLE GIRL PSYCHOPATH.

This girl of 18, with one year's service in the W.A.A.F., was referred to us in 1945 by a Military Psychiatric Hospital after she had made a suicidal attempt by aspirin. She was of good intelligence and there is again a story of broken home life. Her mother died whilst she was young, and she lived in very close contact with her father, who took her out with him everywhere until his death in 1942. She then went to live with an uncle and aunt, who were strict and frowned on the free and easy habits she had acquired whilst living with her father. There was, further, some erotic attraction between herself and the uncle. A visit to the uncle before this girl was discharged from hospital revealed that the mother had been a flighty type. The uncle was very censorious of the patient's promiscuous habits, but at the same time was obviously attracted by her. On the girl's discharge from the Hospital, the After-Care Officer arranged for her to stay at a hostel and tried to keep in close touch with her. She seemed lost at first and started to stay out odd nights. She seemed depressed and also distressed that she did not belong anywhere and she expressed deep conflicts regarding her uncle. It was not possible to establish a really close contact with the girl, as she kept disappearing from the hostel. After she had been missing for several weeks she finally turned up, collected her clothes, and has not been heard of since.

This girl, who is drifting into promiscuity has again quite obvious deep problems connected with her childhood experiences. Reading through her case it becomes very clear that she is driven by something much stronger than her conscious self into her promiscuous life, which she does not really enjoy, as she seems depressed and unhappy most of the time. She was quite unable to make a contact with the Social Worker and had to be left to drift along her unhappy path.

GENERAL.

This group of the unmanageable girl presents a grave problem, to which, I believe, no positive answer has been found yet. Some of these girls are sent to Approved Schools or Borstals, but so often they emerge from there only to repeat their previous pattern of behaviour. I think they are a serious problem,

not so much from the effect their asocial behaviour has on the community, but because they will become the type of unloving mother who produces a problem child, who, in turn, will hit back at society.

Have Psychiatric Social Workers any contribution to make to this problem which is so often regarded as purely a social one and dealt with by Moral Welfare Workers?

THE CHRONIC ALCOHOLIC.

I propose to say very little about this group of failures because it seems to me that when alcoholism has reached the chronic stage necessitating Mental Hospital treatment it is too late for the Social Worker to do any constructive work. Very good contacts have actually been established with alcoholics in the sober remorse state, but in all the cases presented the relationship has never resulted in helping the patient to overcome his alcoholic bouts. I think the essential point here again is that the patient, though consciously even asking for help, has unconsciously accepted the "bottle" as a means of dealing with his conflicts.

THE PARANOID PSYCHOPATH.

This man, aged 44, was referred to the After-Care Service by a Council of Social Service as he seemed unable to settle down to civilian life. He was married and had four children. He showed no responsibility towards his family, refusing to support them, and they were living on Public Assistance. He was spending his time at dog racing tracks and was creating considerable disturbances in the home. He had apparently been fairly stable before the War, but it was not possible to check on this statement. When the After-Care Officer first met this family she referred patient to the local psychiatric clinic and the psychiatrist described the man as an irresponsible rogue, but he was prepared to help the family and see the man at the clinic. The After-Care Officer then set about trying to improve conditions in the home. Arrangements were made for the small children to attend a Day Nursery and for the older child to have meals at school so that patient's wife could give more attention to the home. Material assistance was obtained from the very co-operative Council of Social Service, and for a time it looked as though things were settling a little. Patient seemed more co-operative and inclined to do his bit. Patient's wife was responding to the Worker's encouragement and tried to keep the home better. However, this state of affairs did not last long; patient's aggressive and rather paranoid attitude got the better of him, he made unreasonable demands for large resettlement grants from the Ministry of Labour. The marital difficulties became very severe indeed and the wife began to neglect the home again. The parents were not able to get up early enough to get the children to the Nursery School, and conditions in the home deteriorated until they were again as bad as at the time when the After-Care Officer had first visited. It was then decided to close the case, as it was obvious that in spite of intensive family case work the After-Care Officer had been unable to bring about any improvement in the general situation.

GENERAL.

What has contributed to our failure in the psychopathic group? In most cases the work was on an intensive scale in co-operation with many other Social Agencies, as these people so often find themselves in the most involved and complex situations. One of the characteristics of this group is that unconsciously and at times consciously they prefer their way of life and do not really

want to be helped to achieve the social standards generally accepted. In most of their histories we find evidence that they have been emotionally thwarted in early life and they are now getting the emotional satisfaction of hitting back whether their aggression shows itself in being "agin" the Government and refusing to work unless they get a Government grant of £1,000, or whether it is the aggressive taking of denied pleasures, called stealing, or whether it is symbolized in sexual promiscuity, where quite often longing for affection and revengeful hostility are mixed. These people, emotionally immature, live like children according to what Freud called the pleasure principle. It is a force that drives them mercilessly and which they seem utterly unable to control; the price they have to pay for such behaviour is heavy we know, as most of these psychopaths are miserable, dissatisfied people, and this depressive colouring is, I think, due to an unconscious deep sense of guilt, of which the delinquent type rids himself by going to prison. Their values are, as it were, upside down and they do not possess the tools of control. Is it to be wondered at that in most cases we cannot reach them? In fact, I think by our understanding and unprejudiced attitude we often increase their unconscious sense of guilt as their pattern of life is built on the assumption that nobody wants them and everybody is against them. It is clear that only a very deep going process of rehabilitation, of tackling the problems, both from without and within, will stand any chance of success, that is to say, a process of undoing their false values, followed by a gradual process of helping them to grow up more normally. This is an immense task and probably even if it were feasible there would still be complete misfits in our community, those who are almost constitutionally unable to grow up emotionally along healthy lines. I do not want to appear too gloomy, however, and I must mention here that some few and all the more astonishing successes have been achieved with psychopathic personalities. With these cases I feel that difficult though they were the pattern as described just now was not fully and irretrievably established yet. One case was of a boy described by the psychiatrist of the invaliding Hospital as a criminal psychopath, who was in severe jungle fighting as a youngster, spending his time brothel crawling in India. He was generally completely wild and irresponsible after his discharge. He had experienced great friction in his home, where his mother rejected him, preferring a younger brother. He had always been impulsive and wild as a boy and was regarded as the black sheep in the family. When he came to the notice of the After-Care Service he was already labelled criminal psychopath, and he was full of aggressive impulses, but he was afraid of the aggressive forces in him, had a strong conscious sense of guilt and was still at the stage of openly longing for his mother's affection and approval. He was just standing on the brink, as it were, of becoming a confirmed anti-social being, compensating for the lack of security in his home. The After-Care Officer was able to make a real contact with this boy and to evoke his tender and positive feelings. She became his substitute mother for the time being and he opened up, confiding all his difficulties to her. Having the After-Care Officer's support he was able to relinquish his quest for his mother's love, when attempts to change her attitude towards the boy had failed. After a tremendous row at home he was helped to establish himself in lodgings, and eventually it was possible to fix him up in

agricultural training, which was no small task in view of the fact that he had been labelled a criminal psychopath and moral defective in the D.P.I. This boy has been on a poultry farm now for seven months, and apart from one outburst when he smashed up a few windows, is keeping a precarious adjustment. Here you see was a boy who had all the potential makings of a psychopath and who was just on the point of finding satisfaction in anti-social behaviour because he could not secure his mother's love and approval. It was his good fortune that just at that time he was sent to the people who recognized his fundamental problem and did not spare any effort to see him through this immensely difficult and significant period.

There is hope I feel when there is still a positive conscious longing for affection and approval and feelings of anxiety and guilt about anti-social trends, but even then the potential psychopath with his uncontrollable hunger for emotional satisfaction makes the most enormous demands on the P.S.W., and only mature people who have come to terms with their own aggressive impulses and are able to bear the strain of the patient's incessant demands without anxiety are capable of dealing with them. There are many Social Workers and Psychiatric Social Workers who cannot stand such severe demands and rather than cope anxiously and almost reluctantly it is better not to attempt the case at all.

Here I must reluctantly leave the fascinating subject of the psychopathic personality, a subject that needs much sociological and psychiatric research.

The clue as to why we succeeded in helping some patients and not others is the patient's accessibility. The first group of successes consisted largely of people who had basically a fairly normal structure of personality, but they had come up against specific problems that had created conflict and faulty attitudes or they had not been able to develop their potentialities. They were conscious of their disability and anxious to get better. It was possible, therefore, to establish a contact of dynamic quality, and they were able to take advantage of the help both psychological and material we were able to give them. The group of failures consists largely (though not always) of people with whom we were unable to establish a really creative relationship. The psychotic living in another world and the psychopathic personalities who, because of their abnormal basic pattern of behaviour, were unable to take advantage of the help offered.

THE ROLE OF THE PSYCHIATRIC SOCIAL WORKER.

What is the function in the work described above? I should say that our primary function, without which our work cannot be successful, is to assess correctly and on the deepest level possible the patients' problems and needs so as to arrive at a comprehensive social diagnosis. This applies particularly to the cases referred without a diagnosis from social agencies which naturally normally only recognize the immediate difficulty in the patient they have come across, i.e. the D.R.O. says "This man is unsettled in his work." This complete assessment involves a full social history; psychiatric insight, as we must be able to recognize the patient's possible need for psychiatric advice and for treatment, and sociological knowledge to evaluate the significance of the social problems.

Having made an adequate assessment of the patient's problems and needs it is our function to devise a plan of work. Although it is not always possible to have initial conferences on our cases as in Child Guidance practice, we should be clear in our minds about the basic problem and the aim in our case work. I think we social workers have an unfortunate inclination, through pressure of work and other less obvious mechanisms, to be driven to "do something," and we are not always clear what this "something" is. At times, I admit, we have to feel our way intuitively, but there comes a time when we should be able to say what we are aiming at and why. We hope that with the appointment of Consultant Psychiatrists to the Regions an initial conference with a psychiatrist will become a reality in most cases.

Having decided on the treatment plan I think our functions can be divided into three :

- (1) Personal help to the patient.
- (2) Interpretation of the patient's problems and needs to the family, helping them to adjust to his often changed personality.
- (3) Interpretation of the patient's needs to the community, mostly in the shape of social agencies which are enlisted to help in the rehabilitation of the patient.

The first part of our function is the vital one, without which we are not able to fulfil the other two. We all know that our personal help to the patient may vary from helping him to fill in a form, to a complex relationship amounting to some form of psychotherapy. The vital thing in both forms of contact is our relationship with the patient. Whether we are able to establish this relationship depends not only on the willingness of the patient to co-operate, but also on our own attitude. It is an attitude of opening your mind completely to the needs of another human being, a willingness to understand and accept the situation in which he finds himself as a reality, however confused or shocking this situation may be. It does not always matter so much whether we are completely able to follow the patient in his fantasies as long as we are really prepared to be receptive with our conscious minds, as free as possible from other preoccupations. This understanding and tolerance has an amazing releasing and therapeutic quality. It gives the patient a new feeling of relief and security. There is ample evidence in patients' letters that what they have valued most in the After-Care Service was the understanding and tolerance shown. This experience has been more important to them than practical advice or alterations in their material circumstances which we have been able to achieve. So often patients thank us for what we have done and our reply is that we have done nothing. We have been unable to get the house or the job they were hoping for, and yet they feel the reality of our help. The fact that we have taken their problems seriously and have tried to understand and have made real genuine efforts to help, has had a reassuring and therapeutic effect.

This relationship, which is the key to all personal social service, may make great demands on the tolerance and detachment of the social worker. In intensive case work of the kind described in the depressive group of success cases where patients tend to become utterly dependent for a time and we

clearly stand for a mother substitute, we have to guard against the dangers of the over protective and over-possessive mother. We also have to beware of the danger of the over-indulgent mother, whose child is always right, the danger of over identification with our patient. At the beginning of our relationship, when the patient is so helpless and immature, we may have to nurse him, but in our satisfaction at being able to help him, we should not accept his dependence as a permanent state, and aim at him helping to grow up toward independence. Similarly, in our ardent desire to help our patients, we tend to become so identified with their cause that we cannot see their problem in their wider social context, and so push their claims with a tenacity which, though laudable, ignores the existence of other urgent claims for different sections in the community. The only safeguard against emotional involvement, apart from our training, is, I suggest, to stop our frantic work occasionally and look at ourselves and ask ourselves "What am I doing here? What do I feel about this case, and why?" If we cultivate an awareness of our own attitudes, the danger of our emotions running away with us is minimized. This emotional detachment is also important because of its therapeutic value. We are able to bring relief to the patient because we are outsiders, seeing his problems more objectively. As soon as we become emotionally involved or over-identified with the patient we lose this ability to see his problems in their wholeness, and our usefulness to the patient will be limited.

Whatever the difficulties of this transference relationship, without it we can do very little to help our patients, and whilst we must guard against the dangers of emotional entanglement, we must equally guard against the desire to run away from such relationships. Some people prefer to tackle anything rather than the patient's inner problems. If the patient has difficulties within himself that need adjusting, no amount of environmental changes such as suitable work, material aid, rehousing, will bring about complete rehabilitation. We must, therefore, be at least prepared to acknowledge these personal difficulties, even if we cannot deal with them and shall have to refer them to a psychiatrist. This distinguishes our work from other forms of social work; that we should be aware of the underlying causes of social failure and relate social failure to personality difficulties. If we shut our eyes to these underlying emotional difficulties we shall make very poor interpreters of the patient's needs to the community.

Our role as interpreter to the family, explaining the patient's difficulties and trying where necessary to modify the relatives' attitude towards him, is an important one, as the psychiatrically disabled person is so much more dependent on his environment and his family's ability to understand him than the emotionally mature and balanced person. Indeed much of his eventual recovery will depend on the helpfulness of his immediate environment. Many unhelpful attitudes are due to ignorance and over-protectiveness and are often the result of real concern for the patient such as the mistaken ideas about rest, sanato-gen and breakfast in bed! These attitudes can be modified fairly easily by convincing and imaginative explanation.

Often the family really bears the burden of the patient's illness, and much of our most valuable work consists in showing the wife or mother or husband of

our patient means and ways of shouldering this burden, particularly in cases of permanent personality defect or disablement. In our work with the patient's family we are occasionally faced with a very grave ethical issue. Sometimes the patient's instability is so severe as to endanger the happiness and perhaps permanent well-being of a young family, and yet the patient is utterly dependent on his family and their rejection of him would probably result in a final major breakdown. What are we to do in this dilemma? Encourage the wife with her young children to leave the husband and ensure the happiness of her children at the expense of the patient, or shall we encourage her to stick to the patient and help him toward recovery although the price paid in happiness and stability for the whole family may be very high indeed? It is no good saying the decision lies with the wife or husband. By our contact with the family we do, in fact, influence their decisions, and it is therefore important that we should ourselves face this problem squarely when it arises.

The range of our interpretative work to the community is ever growing and undoubtedly the most important development is adult psychiatric social work. I do not think that explanation of psychiatric illness, its social causation and resulting social problems has ever been carried so far into the community as in our After-Care work. There is now hardly a D.R.O. in the country who has not had personal contact with an After-Care Officer and the opportunity of discussing psychiatric problems as they affect employment. We all know that the D.P.I. in itself is hardly ever sufficient to explain psychiatric disability in terms of employment problems and that particularly in the more complex type of case a much fuller explanation of the patient's difficulties is needed. It is clear that our link with the Ministry of Labour will only be completely satisfactory if and when we have the services of a vocational psychologist also. Most D.R.Os. acknowledge freely that they have derived much help from discussing the bewildering problems of the psychiatrically disabled with us. We, in turn, have also learnt a great deal by coming out of our precious clinics into the hustle and bustle of employment exchanges and by having to face up to some of the grim reality problems in connection with the labour market.

Psychiatric social workers have, for the first time, co-operated with the commissioners of medical services. We have brought to their notice on many occasions the patient's need for treatment and have, I feel, done a great deal towards opening their eyes to the possibilities of skilled social work amongst the psychiatrically disabled. In many instances the Ministry of Pensions doctors have worked with us in a true team spirit. We, in turn, have learnt that the Ministry of Pensions is not quite such a remote, mysterious and inhuman machine as we imagined, and that they are concerned with the pensioner's human problems, and that they are prepared to use their cumbersome machinery to the pensioner's best advantage.

But our activities in the community take us much further than the Ministry of Labour and the Ministry of Pensions. We enlist the help of all possible social resources in the community for his recovery. This brings us into contact with a wide variety of social agencies, statutory and voluntary, and gives us a unique opportunity of widening understanding of mental illness, its social causations, and the possibilities of treatment and social rehabilitation. We

have all spent many useful, though occasionally exasperating, hours discussing a patient's case with the Hon. Secretary of the local S.S.A.F.A., with the Clerk to the Rural District Council, with the Secretary of a Price Regulation Committee, with some obscure official at the Board of Trade, with Area officers of the Assistance Board, with the Red Cross, and countless other representatives of Social Agencies in the community, not to mention colleagues in other fields of social work. I am sure we are not always aware of the cumulative effect of such unobtrusive educational work by personal contact, but I feel confident that its effect will make itself felt in demands for more information and a resulting better understanding of mental illness. Our interpretative function to the community is two-fold. It enables the patient to make use of the social resources in the community which, on account of his instability, he is not able to use efficiently himself, and it enables the social agencies to play a useful part in the rehabilitation of our patients once their problems and needs have been adequately interpreted to them. Without us as the communicating channel, as it were, those two might never meet, as the patient often does not know that the resources exist or are applicable to his case, and the social agencies do not recognize the patient's needs as they are often obscured by complex situations.

Here lies our major strength as P.S.Ws. in recognizing people's inner needs and being able to relate them to the social resources in the community in the widest sense. The more fully we recognize the patient's problems, and the more widely we permeate the community as an interpreter of their needs, the more amply will we justify our title Psychiatric Social Workers.

Finally, in what way does the Psychiatric Social Worker in the community differ from the Psychiatric Social Worker attached to a hospital or clinic? The main essential difference is that we work mostly on our own, and the focus of our work is the patient himself, although activity extends to his family and the community. The Psychiatric Social Worker in a hospital or clinic is the member of a team. She works definitely under the direction of a psychiatrist and her main concern is the patient's family and immediate environment. Some people maintain that, ideally, the P.S.W. in the community should be definitely linked with a psychiatric clinic or hospital. These people have overlooked a vital part of our work. Because we are free floating, as it were, in the community, and have the wide contacts described above, we come across problems of instability and maladjustment that will never reach a clinic without our intermediary help. We have access to them in the first place because we are P.S.Ws. not linked with a definite hospital or clinic. The patient, though unstable and causing concern, may not be aware of his need for treatment, and often we have to do much patient work to awaken this insight; or he may deliberately refuse treatment in which case most clinics and hospitals wash their hands of the patient, but we are able to carry on; perhaps supporting the relatives and seeking patiently for a solution. There are great numbers of unstable people in the community who will never find their way to the clinic directly, and who need at any rate preliminary work by a P.S.W. in the community. There is also the large group of the rather chronic neurotic type, that cannot be helped much at a clinic but needs the patient services of a social

worker with psychiatric insight, who, in conjunction with other social agencies, aims at bringing about some social adjustment within the patient's limits. There is further the large group of patients who only attend for a diagnostic interview, and whose problems are mainly of a social nature which could best be met by a Psychiatric Social community service. At present these patients are shot back into the community by the diagnostician with a short note to the panel doctor. As regards After Care and social rehabilitation of the ex-hospital patient, I feel strongly that we have proved the usefulness of a service radiating from the community rather than from the hospitals from which the patient is trying to break away. The After-Care Officer, working from the community, symbolizes to the patient the first step towards adjustment to community life and, whilst weaning him from the protection of the hospital, she is still able to provide continued support. In this way After Care has developed into a positive service rather than an after thought to treatment. In social rehabilitation, after specific psychiatric treatment is completed, it is further necessary to enlist the help of the social resources in the community, and this a P.S.W., working in the community, may find easier to achieve than the hospital P.S.W., who is of necessity more interested in treatment aspects and not so closely in contact with the wider social resources in the community.

I think, then, that there is a big field for the P.S.W. in the community. By means of her training she will know when to consult a psychiatrist and, in fact, once there are sufficient psychiatric facilities there will be very few cases in which such advice will not be sought. In many instances, however, as we have seen in the cases studied, the problem will be handed back to the social worker with valuable diagnostic guidance. The field that could be covered by the P.S.W. in the community might be summarized as follows :

- (a) Preventive work, spotting minor difficulties of adjustment by making her services freely available to all types of social agencies, including panel doctors.
- (b) Preliminary work with potential patients and their families to pave the way towards treatment.
- (c) After Care and rehabilitation work of the ex-hospital patient and participation in the social re-education of the chronic patient not suitable for clinic or hospital treatment.
- (d) Educational work and research.

Apart from the functional differences that lie in the fact that the P.S.W. in the community is not attached to a specific hospital or clinic and covers fields so far very largely untouched or insufficiently covered by the hospital or clinic P.S.W., her range of work is also, in some ways, different. Psychiatric social community care, as demonstrated by the After-Care service, is an attempt to combine psychiatric social work with general social case work in the widest sense. In clinic work the P.S.W. is usually concerned with the more psychiatric aspects of the patient's or the family's problems, and problems of social and material care are entirely left to the appropriate agencies and very often, I am afraid, they are not tackled at all. This is due to the fact that the clinic P.S.W. must confine herself to her specialist function and has not the time for wider social work. It is also due to her training, where the field is rather

purposely narrowed to the non-material side of her work. In community care, however, where we help the patient to readjust either after treatment is completed or in the absence of psychiatric treatment, we have to use both our trainings to the full, so that hand in hand with psychiatric rehabilitation goes social and economic rehabilitation. I think we have all been amazed to learn how material and practical aid given psychiatrically, that is to say, at the right moment, within the framework of a treatment plan, can contribute substantially to social adjustment.

As I see it, the services of the community P.S.W. are complementary to those of the clinic or hospital team. We hope to fill the gaps before and after treatment, linking up with the clinic services wherever necessary. This will in time mean that the clinic workers will be able to concentrate on the really worthwhile selected cases capable of responding to psychological treatment. So far we have not been able to do much of the sifting and pre-treatment work in the community as we have been overwhelmed with the demand for psychiatric after care, but I think we have proved beyond doubt that there is a useful and essential place for the P.S.W. in the community whose function last but not least will be to link effectively psychiatric and social services.

NEUROSIS AND RELIGIOUS AFFILIATION.*

By ELIOT SLATER, M.D., F.R.C.P.

INTRODUCTION.

DURING the six years of the war, from the opening of the hospital in September, 1939, until the end of September, 1945 (to choose a convenient end-point), 13,556 soldiers, sailors and airmen of non-commissioned rank were admitted to the wards of Sutton Emergency Hospital. From this number have been excluded all women, all foreign troops and prisoners of war, Dominions troops, foreign nationals in the British Army, and also a half dozen or so men of whose religious affiliation no record was kept. Apart from these few accidental exceptions, all men on admission to the hospital gave to a nurse particulars which included their religious affiliation, and which were subsequently entered on the Hospital's Admission Register. From this Register the data which will be discussed below have been obtained. It is to be noted that the religious classification is based solely on the men's own statements; and these may at times have been lacking in precision, or have implied a distinction which does not exist. It is doubtful, for instance, whether there is any real difference between "Wesleyans" and "Methodists"; but as this distinction was made by the men themselves it has been retained.

Out of these 13,556 men, 9,354 were admitted to the neuro-psychiatric wards and 4,202 to the general wards of the hospital. A full account of the first 2,000 men admitted to the neuro-psychiatric wards has already been published (Slater, 1943). About 77 per cent. of them were found to be suffering from neurotic reactions, such as anxiety or hysteria or from psychopathic personality, and the remainder showed states of partially organic causation (8 per cent.), endogenous disorders such as epilepsy, schizophrenia or manic-depressive psychosis (9 per cent.), or minor degrees of mental defect (7 per cent.). The men admitted to the general wards were suffering from wounds, accidents, injuries, infections, such conditions as gastric and duodenal ulcer, defects such as hernia requiring surgical treatment, and the like. The main difference, therefore, between the two groups was the presence or absence of psychiatric disorder. The men in the general wards can be looked on as roughly representative of the Forces as a whole, from whom the neurotic population had also been drawn. The selective processes which secured admission to the general wards may have meant that the men who came there were physically

* A paper read at a Meeting of the South-Eastern Division of the Royal Medico-Psychological Association on 28 October, 1945, at Banstead Hospital, Surrey.

slightly inferior to the average ; but we have no evidence that this would be correlated in any way with religion. There were, however, some other differences between the two groups. At the time of the Dunkirk evacuation in 1940, and again at the time of the invasion of France in 1944, there were considerable numbers of men admitted to the general wards almost directly from the battle-fields. But on the whole, the majority of the men in these wards came from locally situated units, and included a higher proportion of R.A.F. ground staff than the admissions to the psychiatric wards. The psychiatric wards received patients as a part of general routine from a large part of South-Western England, and took considerable numbers of men invalided home on psychiatric grounds from all theatres of war, including the Far Eastern. These differences have to be mentioned ; but it is difficult to see how they could affect the validity of the differences between the two groups in point of religious affiliation.

RELIGIOUS AFFILIATIONS.

Taking together all men who gave the same religion on admission to hospital, we have the following numbers of men admitted to the psychiatric and general wards respectively :

Established and Similar Churches : Church of England, 6,541, 3,174 ; Church of Scotland, 107, 67 ; Church of Wales, 1, 0 ; Church of Ireland, 7, 1 ; Anglo-Catholics, 2, 1. Total, 6,658, 3,243.

Nonconformist Churches : Presbyterian, 290, 139 ; Methodist, 377, 132 ; Wesleyan, 83, 44 ; Baptist, 154, 70 ; Congregational, 69, 35 ; Unitarian, 22, 7 ; Episcopalian, 1, 0 ; Evangelical, 1, 0 ; Denomination unstated, 79, 42. Total, 1,076, 469.

Roman Catholics : 1,100, 427.

Jews : 418, 38.

Other Small Groups : Salvation Army, 41, 7 ; Plymouth Brethren, 6, 4 ; Spiritualist, 11, 2 ; Quaker, 6, 0 ; Four-Square Gospellers, 2, 0 ; Mormons, 2, 0 ; Christian Scientists, 2, 0 ; Theosophists, 2, 0 ; Total, 72, 13.

Oriental Churches : Greek Orthodox, 4, 2 ; Armenian Orthodox, 1, 0 ; Buddhist, 0, 1 ; Hindu, 0, 1 ; Moslem, 1, 0. Total, 6, 4.

Unbelievers : No religion, 9, 3 ; Freethinkers, 2, 0 ; Agnostics, 4, 1 ; Atheists, 9, 4. Total, 24, 8.

Over 70 per cent. of the total belong to the Church of England, which may be taken as a standard for showing whether members of other religious groups have any preferential tendency for or against admission to the neurotic wards. If the quotient obtained by dividing the number of men of one denomination in the psychiatric series by 6,541 is divided by the quotient obtained by dividing the number of men of the same denomination in the general series by 3,174, a figure is derived which will measure this tendency. Dealt with in this way, for instance, the affiliations to the Church of Scotland give a ratio of .775. This is less than 1, and it might be concluded that members of the Church of

Scotland on the whole do not have such a high tendency as members of the Church of England to neurotic breakdown, or at least under war-time Service conditions to admission to a psychiatric hospital. Tested by χ^2 , however, the result is not significant. All the significant differences in distribution are provided by those groups who have a greater tendency to neurosis than the Church of England. They are, with their appropriate ratios and the probability value of the associated χ^2 : Roman Catholics 1.250 ($P < .001$), Methodists 1.386 ($P < .001$), Salvationists 2.843 ($P < .02$), Jews, 5.338 ($P < .001$). If Methodists and Wesleyans had been taken together the corresponding values would have been 1.268 ($P < .01$).

DISCUSSION.

The findings suggest, therefore, that Roman Catholics and Methodists have a somewhat greater tendency to neurosis than members of the Church of England, that members of the Salvation Army have nearly three times and Jews over five times as great a tendency in this direction. Interpretation of these findings cannot, however, be more than speculative. The suggestion arises that in these groups the incidence of neurosis may be raised by men of neurotic disposition finding that particular religion attractive. It is probable that members of the Salvation Army are recruited to a very large extent by conversion. The Salvation Army makes a special effort to attract to a better way of life persons of an irregular social record, among whom a high incidence of neurosis could legitimately be expected. The relative incidence in this group of admissions to general and to neurotic wards can be no matter of surprise. The same considerations apply in a more limited way to the Roman Catholic and Methodist faiths. Both Churches are active evangelically and contain a fair proportion of fresh converts; in both, the non-rational and emotional aspects of religion are given considerable emphasis. This factor would by itself be sufficient to account for the whole of the differences observed. If we assume a 10 per cent. incidence of fresh converts among Roman Catholics and a chance of approximately one in ten (Slater and Slater, 1944) of a man being admitted to a Neurosis Centre during six years of service in the Army, then it is sufficient to treble this chance among the fresh converts to account for the enhanced tendency to neurosis. The fact that this hypothesis is adequate does not, however, mean that it is true.

Matters are different when we consider the Jews. In the Jewish community, as a whole, the proportion of fresh converts must be negligible. Nearly all Jews have been born into the faith, and this has been so for generations. Jews, however, are well known to show constitutional differences from their compatriots in every land where they have been studied; and it is an old clinical observation that they are more than normally subject to psychiatric disorder. The figures reported here would seem to go a long way to support that view. There are, however, other points to be considered. In this material the Jews were unique among all religious groups in showing a progressive rise in their frequency in the neurotic series during the course of the war. The relevant figures are given in the table and diagram below.

	Percentage of Jews in admissions to			
	Neurotic Wards.		General Wards.	
Sept. 1939-Sept. 1940	.	1.3	.	0.2
Oct. 1940-Sept. 1941	.	2.0	.	1.7
Oct. 1941-Sept. 1942	.	3.7	.	2.2
Oct. 1942-Sept. 1943	.	5.0	.	0.6
Oct. 1943-Sept. 1944	.	5.5	.	1.1
Oct. 1944-Sept. 1945	.	6.7	.	0.2



It is to be noted that the proportion of Jews in the admissions to the general wards rises to a peak in 1941-42, and thereafter falls. This would suggest that the proportion of Jews in the Army as a whole was also falling. But the proportion of Jews in the admissions to the neurotic wards rises steadily, until in the last year of the war it is actually over thirty-four times the proportion of Jewish admissions to the general side of the hospital. This change had nothing

to do with, for instance, the enlistment of foreign-born refugees into the Army ; for, as has been said, all foreign nationals were excluded from the figures.

It is clear that we must call into account some factor which varies very largely with time, and that the supposed greater constitutional instability of the Jew is not an adequate explanation. This factor most probably lies in those subtle influences which we designate morale. Few who have worked with neurotic soldiers during the war would deny that the morale of the Jewish neurotic casualty was even lower than that of his non-Jewish brother in arms. It would be superficial to look no further, and simply to lay this to the discredit of Jews as a class. It is a matter of historical record that morale was high among the members of all-Jewish fighting units during the war ; and we know from the distinctions awarded to individual Jewish soldiers in war time, as well as from more recent events in Palestine, that Jews are capable of surviving great military stress without neurotic breakdown. Nevertheless, the Jews of this country are commonly regarded as a pacific people, and they are certainly even more than the average Englishman attached to their immediate domestic circle and the society of their co-religionists. It seems probable that for reasons like these Army life represented for them a relatively greater strain.

SUMMARY AND CONCLUSIONS.

Among the admissions to the neuro-psychiatric and the general wards of Sutton Emergency Hospital during the war, the relative proportions of British soldiers of various religious affiliations have been analysed. It is shown that there is an excess of Roman Catholics, Methodists, members of the Salvation Army and Jews in the admissions to the psychiatric wards. The proportion of Jews in the admissions to the psychiatric wards rose consistently throughout the war from 1·3 per cent. to 6·7 per cent. These findings are discussed.

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CLINICAL NOTE.

A CLINICAL NOTE ON A RAPID METHOD OF DIAGNOSING
BACILLARY DYSENTERY.

By A. W. PETTIT,

Chief Laboratory Technician, Essex County Mental Hospital, Brentwood.

THE following method of rapidly establishing the diagnosis of Bacillary Dysentery has been used at this hospital for the past sixteen years. It is reliable and simple. The technique allows for the transfer of material direct from the infected person to the laboratory medium and obviates waiting for specimens of patients' excreta to become available.

Apparatus.

Test-tubes 8 in. by $1\frac{1}{4}$ in. fitted with corks (for swabs). Test-tubes 5 in. by $\frac{9}{16}$ in. with cotton-wool plugs (for medium). Flexible indiarubber vaginal douche nozzles as used with enema syringes (the swabs).

Media.

Nutrient broth and MacConkey's bile-salt-lactose-agar.

Method.

The sterile swabs are stored in batches of four in sterile water in the large test-tubes (a similar tube with cork containing disinfectant is used to place the swabs in after use). The smaller tubes contain about 5 c.c. of sterile nutrient broth. A swab is taken from the test-tube and passed into the rectum of the patient for a distance of four inches. On withdrawal it is immediately inserted into the broth tube and agitated, thus washing material from the rectum into the broth. The swab is then transferred to the disinfectant tube for subsequent cleaning. The broth tubes are incubated for approximately half an hour and then plated on to MacConkey's medium. For this procedure the use of a platinum loop is favoured rather than a bent glass rod. A single plate and three drops of broth are used, two being deposited as single drops, while a third is drawn across the plate to form a base line from which other lines are drawn at intervals of about $\frac{3}{8}$ in. The loop is then sterilized and cross lines are drawn. By this method of plating single colonies are easily obtainable.

Plates are examined by a 100 watt lamp (the ordinary microscope lamp will serve), the red colonies of the *B. coli* being easily distinguished from the brownish-yellow colonies of Flexner. A single colony of the suspected type is picked off and used for slide agglutination, which will thus establish a diagnosis in 18-24 hours after collection of the swab. For further confirmation, sugar reactions and agglutination in dilution are proceeded with.

Routine.

Single cases are regarded as sporadic. A second case in a ward is an indication for all patients to be examined. This is quite quickly done. All cases are thus classified within 24 hours.

Typical examples recorded in the following tables show that 56.0 per cent. of dysentery patients did not exhibit clinical signs, though they were bacteriologically positive.

Number of patients examined.	Number bacteriologically positive.	Number exhibiting clinical signs.
52	2	1
88	7	3
58	12	5
47	9	4

More than 30,000 swabs have been examined by this method during the past sixteen years, and the need for more selective media than MacConkey's is considered unnecessary.

I wish to thank Dr. G. S. Nightingale, Medical Superintendent, Brentwood Mental Hospital, for permission to publish this technique.

MALE URETHRAL SMEARS IN MENTAL DISORDERS.

(A preliminary communication.)

By R. SESSIONS HODGE, M.R.C.S., L.R.C.P., Y. M. L. GOLLA,
H. M. JACKSON, M.B., Ch.B., and OWEN GEORGE, M.B., B.S.

From the Burden Institute and Gloucester and Tone Vale Mental Hospitals.

IN a recent communication Andrews(1) claims that smears made from the end of the urethra of sexually immature or impotent males differ markedly from the smears obtained from a normal potent male.

The classical researches of Mott demonstrated the existence in many cases of dementia praecox of some degree of testicular atrophy. These observations have been recently confirmed by Hemphill, Reiss and Taylor(2), using a method of biopsy. It appeared, therefore, that the smear method might give information when a series of mental hospital cases were investigated.

Inasmuch as the previous work dealt chiefly with schizophrenics, it was thought that we were more likely to obtain results of value if all cases of conduct disorder in a mental hospital were investigated, without any attempt at more than provisional classification and none at selection of the cases.

A urethral smear was obtained, using a platinum loop, from the terminal $\frac{1}{2}$ cm. of the male urethra, and the smear, spread on a microscope slide, was stained by the Giemsa method. A drop of water on the slide was found to facilitate the preparation of the smear. Each slide was distinguished by a number only, and no comparison between clinical state and microscopic finding was made until the final assessment.

We have attempted a rough classification of the cell types encountered, but we wish to emphasize that our classification has no other justification than the pragmatic one that it allows practically all the normals to be grouped together, whilst a large number of the cases of mental disorder belong to groups excluded from this normal grouping. Beyond this we are not prepared to go. Our grouping in no way predicates any developmental or other relationship between the cell types. In every smear from a normal subject the types of cell shown on the Plate may be found.

In the smears from normal cases A and AB predominate. In the abnormal types, found frequently in our cases of mental disorder, B and BB predominate.

TABLE I.—*Classification of Clinical Types.*

Class.	Number.	Group A—AB.	Group B—BB.
Normals	46	44 (95.6%)	2 (4.3%)
Schizophrenics	147	81 (55.1%)	66 (44.9%)
Secondary dementias	59	31 (50.8%)	28 (49.2%)
Delusional	47	28 (59.7%)	19 (40.3%)
Melancholic	15	7 (46.6%)	8 (53.4%)
Epileptic insanity	21	13 (61.9%)	8 (38.1%)
Mental defectives	36	23 (63.8%)	13 (36.2%)

It is obvious that our results might easily lead to a false interpretation if age bore any relation to the presence or absence of abnormal smears. We decided that our best method would be to take all those groups of cases in which the incidence of abnormal smears was about the same, and it was found that the age-group to which the patient belonged bore no relation to the frequency of an abnormal smear. None of the patients, however, fell into an age-group above eighty-five.

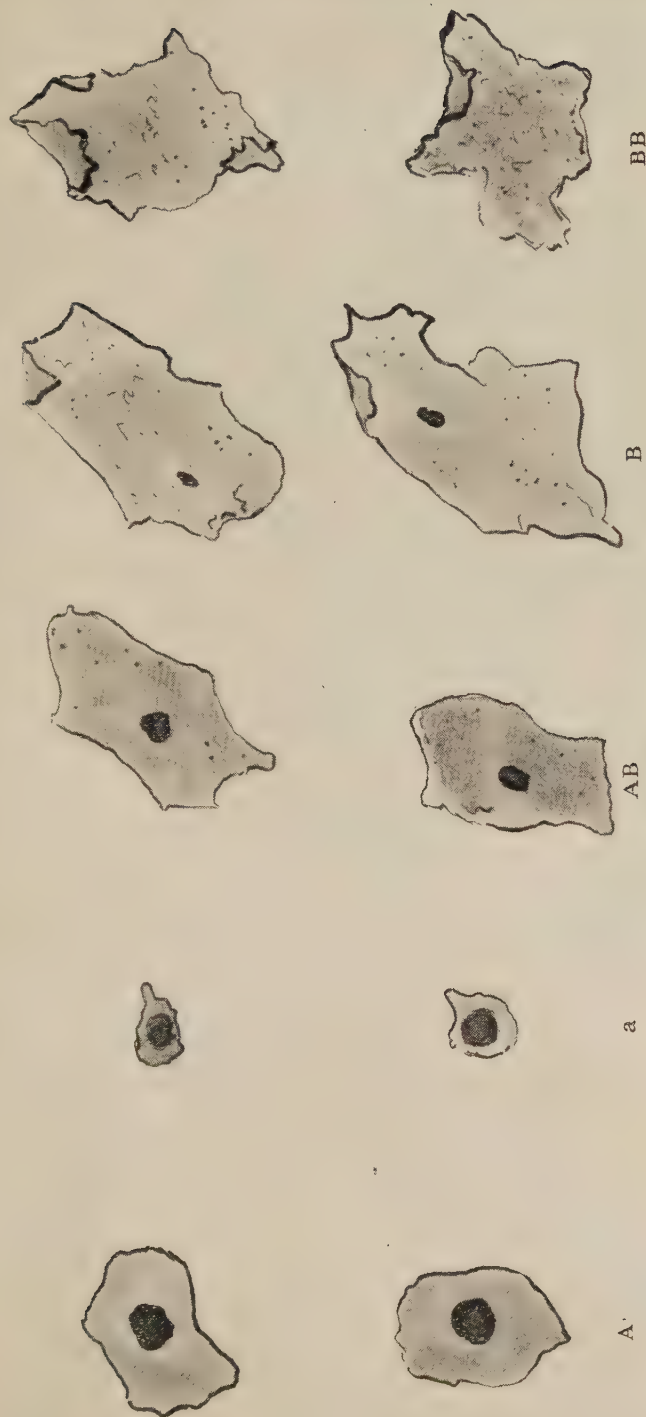
No further speculation as to the meaning of the above findings is offered at this stage. It is planned to carry the investigation further into keto-steroid estimations, when additional information may aid in interpretation.

The majority of the cases of mental disorder were investigated by two of the authors at the Gloucester Mental Hospital by kind permission of the Superintendent, Dr. Logan. Another series was investigated at Tone Vale Mental Hospital by kind permission of Dr. K. C. Bailey. The microscopy and assessment, together with the obtaining of normal records, was done at the Burden Neurological Institute, to whose Director (Prof. F. L. Golla) the authors are deeply indebted for his stimulating advice and criticism.

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EPITHELIAL CELL TYPES FOUND IN URETHRAL SMEAR.



Classification of Cell Types.

- a.*—Small round cells with red staining nucleus and very little cytoplasm.
 - A.*—Medium size epithelial cells with red nucleus, cytoplasm blue or pinkish.
 - AB.*—Larger epithelial cells than *A* with blue nucleus, cytoplasm slightly granular or cornified.
 - B.*—Cells round or angular, larger than in all preceding groups. The nucleus is very small and stained blue. Cytoplasm markedly cornified.
 - BB.*—The nucleus is absent. The cytoplasm blue, taking stain badly and completely cornified.
- Normal.*—*A* and *AB* predominate.

The book will be of particular value to those who are about to take up work in the Juvenile Courts. It also can be wholeheartedly recommended to doctors whose work is concerned with juvenile delinquency, and to others who wish to be introduced to the subject by a reliable writer. W. NORWOOD EAST.

L'Electro-Choc et la Psycho-Physiologie. By JEAN DELAY. Published by Masson et Cie, Paris, 1946. Pp. 169. 230 francs.

This book describes in some detail certain biochemical and physiological investigations conducted by the author and his collaborators on patients undergoing electro-shock treatment.

He has endeavoured to demonstrate physiological phenomena due to electrically-induced convulsions, and from his results to construct a theory for the mechanism of cure.

The number of patients studied is not large, and being divided among various psychoses, the conclusions can only be regarded as tentative.

The author suggests that disturbances in the hypothalamus are causative of various psychoses, and attributes the beneficial effect of electro-shock treatment to its influence on the hypothalamic and vegetative systems.

The book is of value chiefly for the lines of thought it suggests, and should be studied by those undertaking research in convulsive therapy.

The bibliography is extensive, and demonstrates the lively research in psychiatric problems that was conducted in France even under German occupation.

R. E. HEMPHILL.

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Two New Drugs in Epilepsy Therapy.

Two new drugs increase the range and the effectiveness of the control of epileptic seizures.

Trimethyloxazolidine dione (tridione) used alone has proved wonderfully effective in controlling seizures of the *petit mal* triad—*petit mal* (pykno-epilepsy), myoclonic jerks and akinetic seizures. In contrast, *grand mal* convulsions were not helped or were made worse. Psychomotor seizures were occasionally aided by tridione combined with an anticonvulsant drug.

Methyl phenyl ethyl hydantoin (mesantoin), used in 35 patients, did not help *petit mal*, but in approximately one-third of patients subject to frequent major seizures it has replaced diphenyl hydantoin (dilantin) with profit; the benefit resulted either from a reduction in the frequency of convulsions, or from an absence of the unpleasant side-effects of either muscular inco-ordination or gum hypertrophy. Generalized rash or somnolence were side-effects which limited the usefulness of the drug in many patients. (Author's abstr.)

Further Observation on the Use of Tridione in the Control of Psychomotor Attacks.

Tridione, a new addition to the treatment of the cerebral dysrhythmias, is helpful in the control of psychomotor seizures. While effective in certain instances if used alone, it is most helpful if used in combination with sodium diphenylhydantoinate and/or phenobarbital.

Toxic symptoms are infrequent in patients who respond to the drug, and do not constitute an important contraindication to its use.

Further research on the oxazolidine-2,-4-dione derivatives and related drugs may afford further advances in the therapy of epilepsy. (Author's abstr.)

Orbital Cortex Syndrome following Leucotomy.

1. The orbital cortex was partly isolated in 22 schizophrenics, and good response was observed where there were symptoms of introversion, blockage, emotional dulling and depersonalization present.

2. The isolation of the orbital lobe produced a triad of symptoms described as extroversion, increased motor activity and euphoria.

3. It was emphasized that the new symptoms produced balance well with the pre-existing psychotic symptoms. (Author's abstr.)

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Studies of the Cortical Projection of the Labyrinth. I. Some Effects of Labyrinthine Stimulation upon the Electrical Activity of the Cerebral Cortex.

Electroencephalographic measurements made on a cat placed in an activity cage, the speed of which could be regulated, revealed that either positive or negative acceleration of the speed of the cage resulted in electrical activity of increased amplitude and frequency. The maximal effect was localized in the vestibular projection area in the posterior suprasylvian convolution. (Psychol. Abstr.)

VOL. LI.	1941.
*The Functional State of the Cerebral Cortex in the Course of Animal Hypnosis. <i>Gerebtzoff, M. A.</i>	365

The Functional State of the Cerebral Cortex in the Course of Animal Hypnosis.

Cats and rabbits in a hypnotic state showed a marked rise in the threshold of excitability of the cortical motor area controlling mastication. It was also observed that the electrical activity of the brain was similar to that in sleep in that the amplitude of the brain waves increased while the frequency decreased. These results are interpreted as illustrating the effect of a subcortical inhibition.

(Psychol. Abstr.)

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NEW YORK NEUROLOGICAL SOCIETY AND THE NEW YORK ACADEMY OF MEDICINE.

- Intravenous Administration of Histamine in Treatment of Migraine. *Thomas, W. A., and Butler, S.* 356

Pre-traumatic Personality and Psychiatric Sequelae of Head Injury. II. Correlation of Multiple, Specific Factors in the Pre-traumatic Personality and Psychiatric Reactions to Head Injury, Based on Analysis of One Hundred and One Cases.

One hundred and one civilians with acute head injuries were subjected to intensive study of multiple factors in the pre-traumatic and the post-traumatic personality status. A clinical quantitated estimate was made of the degree of each of these specific personality factors. With such a method a multidimensional perspective of each patient was obtained, by which it was possible to quantitate changes, if any, in personality following head injury.

In addition, all patients were given categorical classifications of the pre-traumatic personality (normal, psychoneurotic, psychovariant and psychopathic).

Correlations were made with the nature and estimated severity of the acute

cerebral trauma and with various potentially complicating factors, such as associated bodily injuries and various possible sources of psychologic stress (litigation, occupation and financial and marital difficulties).

It was found that in a number of patients neurotic symptoms appeared for the first time after head injury. In most patients psychologic changes following head injury became most manifest shortly after discharge from the hospital and were at a maximum three to six weeks after discharge. The duration of post-traumatic symptoms varied, but in general they were substantially receding at the end of three months. However, approximately 50 per cent. of the patients showed some persistence of symptoms at six months, and approximately 15 per cent. had symptoms which persisted a year or longer. The duration of incapacity for work paralleled the persistence of psychologic symptoms; but most patients returned to work before they were entirely free of symptoms.

Patients with pre-traumatic psychoneurotic personalities showed a greater proportion of post-traumatic psychiatric symptoms than did patients in other groups. However, the patients with pre-traumatic normal personalities were closer to the psychoneurotic patients than were members of other groups.

There was no close correlation between the severity of the acute injury of the brain and the severity of the sequelae.

There was high correlation between the existence of persistent complicating psychosocial factors, such as continuing compensation, pending litigation, occupational stresses and persistent associated bodily injuries, and the severity and persistence of psychiatric sequelae.

No correlations were found which would permit the ascription of psychiatric sequelae to one particular cause or group of causes. The psychiatric sequelae in an individual case were usually the resultant of various factors. The etiologic factors in the psychiatric sequelae in a particular case depended on specific factors in that case.

(Author's abstr.)

OCTOBER.

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Primary Behavior Disorders and Psychopathic Personality. I. Correlations of the Electroencephalogram with Family History and Antecedent Illness or Injury.

1. Two hundred patients, 100 each with primary behavior disorders and with psychopathic personality, showed considerably higher percentages of electrocortical abnormality, 56 and 58 per cent., respectively, than the percentages reported for presumably neurologically normal children and adults.

2. Fourteen per cent. of the patients with primary behavior disorders, in contrast to 2 per cent. of the patients with psychopathic personality, had paroxysmal electroencephalographic activity.

3. The incidences in the family history of epilepsy, maladjusted personality, chronic alcoholism and psychosis were similar in the two diagnostic groups.

4. The incidences in the personal history of convulsions, severe illness and questionable birth injury were greater for the group of patients with primary behavior disorders than for the group with psychopathic personality. The incidences of head injury were similar for the two groups.

5. When the two groups of patients were combined, significantly greater proportions of abnormal electroencephalograms were found when there was a family history of either epilepsy or of maladjusted personality.

6. The proportion of patients showing electroencephalographic abnormality appeared to be greater when the mothers were judged maladjusted or alcoholic than when the fathers were so judged.

7. When the two groups of patients were combined, significantly greater proportions of abnormal electroencephalograms were found when there was a personal history of convulsions, head injury with unconsciousness or severe illness.

8. For the category of severe illness, the younger the patient at the time of the illness and/or the more severe the illness, the greater the probability of abnormal electrocortical activity.

(Authors' abstr.)

NOVEMBER.

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Effect of Glutamic Acid on Mental Functioning in Children and in Adolescents.

On verbal, motor and personality tests given, definite improvement following glutamic acid therapy could be observed in each of our nine subjects during a six months' interval. A number of experiments have pointed to the fact that l (+)-glutamic acid has a particular relation to cerebral metabolism. Weil-Malherbe reported that l (+)-glutamic acid is the only amino acid known to be metabolized by slices of brain tissue. Recent investigations of Nachmansohn and his associates suggest that the release of acetylcholine is intrinsically connected with the electrical changes during nerve activity. They found that the energy of the action potential

is derived from energy-rich phosphate compounds and concluded that these compounds yield the energy for the formation of acetylcholine. As a result of these observations they isolated an enzyme from the brain which synthesizes acetylcholine. This enzyme, choline acetylase, becomes inactive on dialysis. Addition of 1 (+)-glutamic acid reactivates the enzyme.

While the precise mechanism of the action of glutamic acid on the rate of acetylcholine has still to be elucidated, the intrinsic connection of acetylcholine with nerve activity and the demonstration of an increased rate of formation of acetylcholine in the presence of glutamic acid *in vitro* make it possible to assume that the physiologic basis of the observed effects of glutamic acid is in some way related to the formation of acetylcholine. At present this seems to be the best interpretation. (Authors' abstr.)

Electrical Resistance of the Skin : Effect of Size of Electrodes, Exercise and Cutaneous Hydration.

The following observations were made: 1. Apparent skin resistance decreases (a) as the size of the electrode is increased, and (b) as the superficial layer or layers of skin become hydrated as a result of continuous contact of electrode paste with the skin. 2. Apparent skin resistance increases during rest following exercise or activity. 3. The size of the electrode is determined by the area of skin wet with the electrode paste or sweat (effective electrode), and not by the absolute size of any part of the electrode itself. 4. Any aqueous film, such as sweat, outside the area of the electrode, but continuous with the electrode paste, acts to increase the size of the effective electrode. 5. The values for apparent resistance of two areas of skin, such as the palmar and the volar surface of the forearms, which may differ greatly when the subject is at rest, approach the same magnitude when the patient exercises vigorously.

In any experiment in which the effect of a stimulus on apparent skin resistance is being measured one should be sure that the resistance is not changing as a result of (a) variation in the area of skin wet with the electrode paste or with sweat, (b) rest following exercise, or (c) hydration of the skin by the electrode paste.

(Authors' abstr.)

Intravenous Injection of Sodium Amytal as a Test for Latent Anxiety.

1. Anxiety or tension states may give rise to symptoms referable to many systems of the body, even in patients not considered psychoneurotic.

2. Symptoms due to organic disease may be exacerbated because of tension.

3. Sodium amytal in average doses of $1\frac{1}{2}$ grains (0.097 gm.) given intravenously will frequently relieve a symptom which is entirely due to tension within one to five minutes.

4. The same amount of sodium amytal will relieve that portion of the symptom due to tension in instances in which tensional pain is superimposed on pain or organic cause.

5. Sodium amytal in small doses can be used as a diagnostic test to separate symptoms of organic disease from tension symptoms.

6. The test should be used only to supplement thorough physical and psychiatric investigation.

(Authors' abstr.)

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Anosognosia and Disorders of Body Scheme.

Anosognosia, it is suggested, may be produced by brain damage of two kinds—focal and diffuse. That anosognosia of blindness can result from peripheral lesions blotting out the visual fields, has been shown by Redlich and Dorsey (1945); there is always co-existing clouding of consciousness. The second patient here described is another example of anosognosia of total blindness which was peripherally determined. Anosognosia of hemiplegia unassociated with agnosia of the body-half, it is thought may likewise result from non-specific lesions outside the thalamo-parietal segment but that there needs must be a defect of judgment such as may exist in a confusional state. The third patient is thought to illustrate such a mechanism.

It is also suggested that psychological factors underlying the delusion that disease does not exist, include defects in perception and in memory retention. The affective element in perception is thought to be another factor in the production of anosognosia. In Case 2 a strong desire not to suffer the disability which afflicted her was thought to be an additional factor in warping judgment and producing denial of blindness.

Anosognosia of blindness and of hemiplegia are believed to be predisposed by disorders of space perception. A distinction is drawn between awareness of personal space and awareness of extra-personal space. Though there may exist agnosia of both these aspects of space in the same subject, they may occur separately so that it is probable that they are subserved by separate neural links. Interruption of association paths from the occipital and parietal cortex to other parts of the brain probably account for the impaired space perception.

Agnosia of half extra-personal space may lead to neglect not only of half-space but to neglect of inability to see the contents of half-space (anosognosia of hemianopia). Bilateral lesions producing bilateral neglect of extra-personal space are thought to predispose towards anosognosia of total blindness, a condition which exists as a fixed delusion only when mental confusion is added.

Agnosia of half personal space leads not only to neglect of its contents (the body-half) but to paralysis involving the body-half (anosognosia of hemiplegia), a condition which exists as a fixed delusion only when mental confusion is added.

Agnosia of personal and extra-personal space, it is thought may be due to specific kinds of memory loss.

The first patient is an example both of agnosia of extra-personal space, producing anosognosia of hemianopia and of agnosia of personal space, producing agnosia of the body-half and anosognosia of hemiplegia. The delusion was fixed because mental confusion impaired judgment.

In this patient there was also an unusual response to pain stimulation which was interpreted as being a pseudo-affective reflex analogous to "sham-rage" seen in thalamic animals. (Author's abstr.)

Coughing and Unconsciousness: The So-called Laryngeal Epilepsy.

It seems probable that the syndrome in which loss of consciousness associated with coughing are the predominant symptoms has no single basis of causation. True vertigo is rarely, if ever, present, and the name "laryngeal vertigo" should not be used.

Some cases are epileptic in origin, but there is evidence that a majority may result from the circulatory changes induced by the cough. A diagnosis of epilepsy should only be made when other evidence points to the patient being an epileptic. Unless there are clear indications, as shown for instance by the tendency to recurrence and the occurrence of attacks unassociated with coughing, or when the EEG points to epilepsy, the basis of attacks should be regarded as cardiovascular in origin. (Author's abstr.)

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Acute Porphyria. Report of a Fatal Case with Severe Neurologic Manifestations Encountered in the South-West Pacific.

This case proved of particular interest to the authors, for at the time they first examined the patient, they had in their neurologic ward several patients who had symptoms of neuronitis, neuromyelitis and various types of peripheral neuritis. Patients with such symptoms had been coming into the hospital with surprising frequency. The symptoms of many of these patients seemed to be due to a virus infection or to scrub typhus fever, malaria, trauma, vitamin deficiency and so forth. However, in this case, the authors were confronted with the classical picture of recurrent episodes of abdominal pains and constipation (obstipation) followed by pain in the extremities and weakness. Appendectomy had been performed as is so frequently reported by those who have had recurrent attacks of acute porphyria. The color changes in the urine and the subsequent chemical analysis of the urine disclosing increased amounts of coproporphyrin and large concentration of uroporphyrin and porphobilinogen substantiated the authors' first impression of acute porphyria.

The neurologic picture presented by the authors' patient is of particular interest in that he did not display the typical Landry's syndrome; his paralysis first involved the proximal muscles of the extremities and spread peripherally with more involvement of the upper than the lower extremities. Likewise there was early and intensive involvement of the extensor muscle groups. This was in keeping with the condition of many of the patients suffering from a probable virus form of neuronitis who were under the authors' care at that time. Although the patient's paralysis was relatively symmetrical the paralysis of acute porphyria is not always so, for in most of the 143 cases reviewed by Waldenstrom, in 60 of which neurologic signs were present, the paralysis was irregularly distributed, and frequently involved only small muscle groups, although in many almost the entire striated musculature was involved. Generalized convulsions (*status epilepticus*) and paralysis of deglutition (bulbar) experienced by the authors' patient are common findings, as have been emphasized by Mason and his associates, Hoagland, Nesbitt, Baker and Watson.

The therapy of acute porphyria is at best only symptomatic. As has already been noted, it would seem that serious attention might well be directed toward protecting the liver against the agent responsible for the necrobiosis, whatever it may be, since there is unmistakable evidence of diffuse liver damage. For the present, the intravenous administration of glucose and thiamin appears to be the authors' best means of protecting the liver. Although this type of therapy seems to have delayed only slightly the fatal issue in the authors' case, it must be remembered that acute porphyria is actually a chronic disease with acute exacerbations, and in certain instances the intensive use of glucose and thiamine, may carry the patient through the acute phase.

Parenteral administration of calcium has been suggested since calcium forms an insoluble salt with porphyrins. Its intravenous administration has been reported to diminish the excretion of porphyrins in the urine as well as to relieve abdominal pain. The authors' patient failed to respond clinically to the intravenous administration of calcium gluconate. Likewise it did not alter the portwine color of the urine.

(Authors' abstr.)

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Effect on the Nerves of Central Inhibitory Phenomena.

When a head band protecting their eyes from light was used, an increase in the chronaxie of peripheral motor and sensory nerves was noted in the case of guinea-pigs and frogs. It was further noted that pressure of the head sufficient to produce a state of torpor left the chronaxie measurements unchanged. (Psychol. Abstr.)

Effect of the Central Nervous System on the Variations of Excitability of Motor Nerves in the Course of Peripheral Thermal Activity.

A slight warming of a dog's paw or a human subject's hand results in an increase in the chronaxie of peripheral nerves. For the dogs, chronaxie measured in the motor cortex is affected similarly. Either chloroform anaesthesia or expanding the surface stimulated, however, reverses the effect. (Psychol. Abstr.)

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Sub-shock Insulin Therapy in Anxiety States and Anxiety Depressions.

1. Thirty-seven patients with anxiety states, depression, and psychosomatic disturbances have been treated with daily 30-60 unit doses of insulin.

2. The rationale and technique of administration of this therapy have been discussed, together with a synopsis of the successful termination or alleviation of their symptoms.

3. Several case-histories have been selected from the group to illustrate the type of patients treated and the responses obtained by treatment.

4. This series of cases indicates that this therapy is a valuable, effective, safe method of treatment in a variety of anxiety states, particularly those arising in the military service and in men with combat experiences. (Authors' abstr.)

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The Relation of Emotional Adjustment to Intellectual Function.

Since 1937 personality studies of normal children have been in progress at the Payne Whitney Nursery School. The records include anamnestic data, physical examination reports, psychometric test findings, daily behavior records, and individual play sessions. This method of investigation permits the analysis of any one phase of behavior in relation to any other phase. In the present study, an attempt has been made to establish whether any relation could be found between intellectual function, as measured by means of psychometric tests, and emotional adjustment, as evaluated through the total data. The trends of emotional adjustment were formulated independently of the findings of the psychometric tests.

Of the children admitted during the period from 1937 to 1942, 39 children had at least two psychometric tests in the course of two or three years' attendance at the school. On retest, 22 showed changes in I.Q. which were considered significant (10 points or more in either direction), and 17 showed no significant changes (less than 10 I.Q. points, or no change in either direction).

Of the 22 children with significant changes, 12 showed an increase in I.Q. rating of from 10 to 31 points, and 10 a significant decrease of from 10 to 19 points. In all of the 22 children which made up the two subgroups, there was a close parallel between emotional adjustment and psychometric test findings.

The 17 children without significant changes in I.Q. presented a more complex problem of analysis. They included two categories of children: stable, well-adjusted children whose home life seemed to present no cause for emotional disturbances; and children whose home conditions, while unsatisfactory, did not show variations or tendency toward marked improvement or further dislocation. The margin of error for predictability of I.Q. changes on the basis of biographical data was higher in this group than in the group with significant changes. In six children, variations in I.Q. were predicted in another direction than that afterwards noted or were quantitatively inaccurate though in the direction predicted.

The present study emphasizes that intellectual function, as measured through psychometric tests, shows fluctuations, and that the child's total emotional adjustment influences his test score. It also points to the need of a projective technique, in addition to the usual methods of psychometric testing, as a means of detecting factors inhibiting the intellectual function.

The clinical data have been presented and analyzed, but no hypothesis has been formulated regarding the inhibition of the intellectual function through emotional causes. (Authors' abstr.)

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What Price Lobotomy?

1. The subjects of this study are ten schizophrenic patients who have undergone bilateral prefrontal lobotomy. Five of them are discharged, and five still hospitalized. They are compared with a group of seven patients of similar diagnosis and vocabulary ability who have not suffered the operation.

2. The lobotomized individuals maintain many of their prepsychotic character traits, but they are lacking in a normal degree of deliberateness.

3. They show no unique characteristics in the projective (Rorschach) and intelligence (Binet) tests, do about as well as the control group of schizophrenics in abstract thinking (Shipley-Hartford), better in learning (Hunt-Minnesota), but less well in alternating attention and making a plan (Porteus Mazes).

4. They do significantly less well than the controls on two tests demanding deliberation (Rhymes and Numbers), standardized on a group of 105 junior college students.

5. They do significantly less well than the controls of tests demanding deliberative behavior (Downey's Speed of Decision, Volitional Perseveration, and Motor Inhibition).

6. It is concluded that bilateral prefrontal lobotomy, though of proved therapeutic value (and affording remarkable opportunities for research) is productive of a definite mental deficit; it reduces the capacity for prolonged attention.

(Author's abstr.)

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The Effect of Prolonged Mild Anoxia on Speech Intelligibility.

(1) Using the method and materials employed in an earlier study in collaboration with C. P. Seitz, twelve subjects were tested for their ability to perceive standard speech sounds at four periods during an eight-hour exposure to mild anoxia encountered at an altitude of approximately 10,000 ft., simulated in a nitrogen dilution chamber. (2) The decrement in speech intelligibility at altitude was very slight and unreliable at the $\frac{3}{4}$ -hour period; it was nearly reliable at the $2\frac{1}{4}$ -hour and $4\frac{1}{4}$ -hour periods; but there was a marked lessening of the altitude effect at the last period, $6\frac{3}{4}$ hours after entering the chamber.

Psychological factors, such as wandering of attention and boredom are suggested as explanations of the apparent losses in efficiency, although some physiological consequences of altitude changes are indicated by enlarged angioscotoma during prolonged exposure to increased altitude. *H. HILL (Psychol. Abstr.).*

Validity of the Hunt-Minnesota Test for Organic Brain Damage.

(1) When the Hunt-Minnesota Test for organic damage was applied to 64 presumably normal employees of the Norwich State Hospital, 55 per cent. had T scores indicating organic pathology. (2) The discrepancy between our results and Hunt's original validation results could not be explained by the fact that our data included cases with very high vocabularies and cases given only the short form of the test. (3) Since the test produces so many "false positives," its validity for diagnosing organic brain damage must be seriously questioned.

H. HILL (Psychol. Abstr.).

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An Experimental Study of the Reactions of Neurotics to Experiences of Success and Failure.

A modified form of the pursuit rotor, involving an integrating mechanism, was used in obtaining performance scores, aspiration scores, and judgments of past performances. One hundred male neurotic army patients were tested, 50 of whom showed predominantly hysterical symptoms, while the other 50 showed predominantly affective symptoms. The two groups were equated for age and intelligence. The main hypothesis tested in this experiment was based on Jung's analysis of extraverted (hysterical) and introverted (affective) personality traits, and more particularly on his view that introverts are more affected by subjective factors, while extraverts are more affected by objective factors.

The results showed no significant differences between the groups for performance or improvement on the test. It was found, however, that both as regards their level of aspiration and their judgment of past performances the affective group showed significantly greater deviations from their actual scores than did the hysterical group. Quite generally the reactions to success and failure of the hysterical group were more objective, taking more account of external reality (test scores), while the reactions of the affective group were more subjective, taking more account of subjective states of mind.

Correlations were found between level of aspiration and judgment of past performance which indicated that "tendency to subjectivity" could be shown to be an important factor common to both these superficially quite unrelated scores. Further correlations were found between intelligence test scores, improvement,

level of aspiration, judgment of past performance, and a number of desirable and undesirable social qualities. It was also found that hysterics showed a greater intrapersonal variability, while the affectives as a group showed a greater interpersonal variability. (Authors' abstr.)

Expectancy versus Performance in Hypnosis.

This article is devoted primarily to the description of experiments on 10 selected and highly developed hypnotic subjects in whom strength of grip and expectancy were controlled by hypnosis. Complete or partial paralysis was produced in all the subjects, while their hypnotically controlled belief was that they were weaker than usual. Then their strength of grip was increased while their hypnotically induced belief was that they were weaker than usual.

These results contradict the suggestion theory of hypnosis, as illustrated by an experiment described by Crane, in which the two factors of expectancy and hypnotic performance are commonly said to be related causally—hypnotic phenomena being regarded as caused by expectancy.

Implication of the results of these experiments are pointed out, not only in regard to the distinction between the art of suggestion and the art of hypnosis, but also in regard to the relation of expectancy to disability in clinical cases of functional illness. (Author's abstr.)

OCTOBER.

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Electrometric Studies of Sleep.

A technique has been described, embodying simultaneous DC and AC recording, for the measurement of changes taking place in the steady-state DC field of the human organism between the waking and the sleeping states.

The results indicate:

1. That the DC field of the human organism exhibits during sleep a decrease in the mean values of the potential differences recorded from different points related to the organism's nervous system.
2. That sleep produces a gradual reduction of the characteristic waking differences in E.M.F. which distinguish one individual from another at a given time and from himself at other times.
3. That the DC field of the human organism exhibits during sleep less inter-subject variability for a given electrode placement than during waking.
4. That the DC field of the human organism exhibits during sleep less variability among different electrode placements than during waking. (Author's abstr.)

Level of Muscular Tension as an Aspect of Personality.

A general factor of muscular tension level in the individual has frequently been postulated. In previous studies the writer has found evidence for this assumption in the fact that subjects who were most tense during the performance of one task tended to be most tense during the performance of another task, and the tension *rank* (as opposed to the absolute tension *level*) of the individual during the performance of a given task tended to remain constant over a period of several months. In the present study the aim was to find further evidence of a factor of general level of muscular tension through determining whether such a factor could be extracted from measures of tension secured: (a) On different occasions, (b) during the performance of different tasks, and (c) by different techniques of measurement (some involving grip pressure and some point pressure).

Twelve measures of muscular tension and four measures of fluctuation in tension, obtained while the subjects were performing a wide variety of tasks, were subjected

to factorial analysis. These measures were secured on three separate occasions, the first separated from the second by three months, and the second separated from the third by one week. Three different techniques for measuring tension were employed: (a) Recording grip pressure from the unused hand, (b) recording grip pressure from the used hand, and (c) recording point pressure by counting the number of sheets of carbon paper through which pencil marks had penetrated.

Five factors were obtained, four of which appear to be meaningful. Of the meaningful factors, Factor I is widely general, Factor IV has considerable generality, and Factors II and III appear to be specific.

Factor I, the most general of the factors extracted, is interpreted as representing a general tension factor of the sort postulated by the writer in the first quantitative investigations in which individual differences in tension were regarded as a significant aspect of personality. This factor incorporates a variety of tasks, all three techniques of tension measurement, and all three experimental sessions. Its generality is attested by the fact that, in addition to its six weights above .40, it includes more weights between .30 and .40 than does any other of the factors extracted. Factor I, then, is interpreted as a factor which represents the general tension level of the subjects, or the tendency of the subjects to function more or less consistently at a relatively high or a relatively low level of tension during a wide variety of tasks performed on three separate occasions over a period of several months. It is a factor attesting the fact that tension is not specific to the task being performed, nor to the time of measurement (within the limits of the experiment), and is, to only a limited extent, dependent upon whether point pressure or grip pressure is being measured, or whether the measurement is made from the used or the unused hand.

One other factor, Factor IV, has some degree of generality, since it may be described as a factor of point pressure during a variety of tasks performed at two different experimental sessions separated by an interval of one week. The fact that the weights on this factor are arranged in what would appear to be the order of difficulty of the tasks involved, suggest that Factor IV is an aspect of tension and not merely a factor representing some incidental feature of the technique of measurement.

Factors II and III are specific factors. Factor II appears to represent point pressure during maze tracing. Factor III is probably specific to color-naming, or to the first experimental session, or to grip pressure from the unused hand, or to some combination of these aspects of the experimental situation. The design of the experiment does not permit finer delineation of this factor.

From the present study it may be concluded that there are both specific and general factors in the measurement of tension. Tension scores vary somewhat with the technique of measurement, with the nature of the task being performed, and with the time at which the measurement is made. But there is a general factor of tension which is more or less independent of the task, of the mode of tension measurement, and of the time at which the measurement is made. The isolation of this factor lends support to the notion that tension level is a more or less persistent characteristic of the individual, and is, in this sense, an aspect of personality.

The general factor of muscular tension found here is, the author believes, but one of a number of indicators of the energy mobilization of the individual. Palmar skin conductance, for example, has been found to vary directly with variations in tension of the muscles. Muscular tension would also correlate, no doubt, with insensible weight loss or other measures of metabolic activity. In fact, we should expect a correlation between muscular tension and any one of the physiological changes found by Cannon to be a part of the energy mobilizing processes which occur during the excited emotions—and which, we should suppose, would occur under any other circumstances which involve the mobilization of energy.

Energy mobilization tendencies constitute one of the most significant aspects of the individual's personality. They represent the intensity with which he responds to the various environmental situations with which he is confronted. They indicate, then, whether he is likely to be relatively unresponsive to situations, highly responsive, or moderately responsive. And this tendency to respond to situations with high, with low, or with some intermediate degree of energy mobilization is the basis for a wide variety of behavioral manifestations which differentiate one individual from another.

(Author's abstr.)

The Effect of Prolonged Mild Anoxia on Sleepiness, Irritability, Boredom and other Subjective Conditions.

Sixteen male college students, with a median age of 18 years 4 months, were asked to rate themselves with respect to 10 different subjective conditions at five different periods during a continuous 8-hour session in a nitrogen dilution chamber in which an altitude of approximately 10,000 ft. was simulated. The same procedure was followed during an 8-hour control run. The conditions rated were sleepiness, fatigue, boredom, attention, irritability, headache, elation-depression, motivation, co-ordination, and general feeling of well-being. Although the results for the altitude and control runs varied from one condition to another, there was, on the average, a pronounced trend on the altitude run in the direction of poorer adjustment from the first period, 1½ hours after admission to the chamber, through the fourth period, which occurred after an exposure of 6½ hours. The differences between the mean ratings for the control and altitude runs were in every case reliable at the points of maximum divergence, which occurred most frequently at the fourth rating period. There was, in general, a marked end-spurt between the fourth and fifth period when the subjects were aware that their ordeal was nearly over. There was also a marked drop in adjustment on most of the control runs following the lunch period. If such a tendency was present in the altitude runs this was submerged by the general downward trend of the curves. The results jibe with the frequent reports by crews of heavy bombers of feelings of boredom, sleepiness, and wandering of attention on protracted bombing sessions while flying without oxygen masks at comparatively low altitudes on the way to and from target areas. They would seem to indicate the need for more adequate precautions against anoxia even at relatively low cruising altitudes if alertness, freedom from distraction, and a higher order of motivation are required.

(Author's abstr.).

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Analysis of One Hundred Cases of Epilepsy.

(1) The catamnesis of 100 epileptics has revealed that among the dispositional factors head injuries play a major role, whereas the role of heredity is negligible.

(2) There are infrequent cases of epilepsy which do not exhibit a disturbance in the brain waves during the attack-free intervals. The change in the brain waves, if present, persists even after cessation of the attacks. Any medicinal treatment of epilepsy should be combined with hygienic measures, and with a particular diet omitting and reducing the salt intake.

(3) Three types of drugs are capable of controlling epilepsy: The barbiturates, sodium dilantin and methylphenylethyl-hydantoinate (mesantoin). Whereas the effect of the barbiturates frequently starts only after some years, even as late as after ten years, that of the hydantoinates sets in immediately or after a few months. Apart from an occasional rash, no unfavorable sequelae of the hydantoinates were observed.

(4) Apparently there is an individual reactivity to the remedies in question, and there are even cases intractable to all of them. One may, as necessity arises, replace the barbiturates with dilantin, and the latter with the hydantoinate preparation which exercises a particularly favorable influence on *petit mal* attacks.

(5) When the attacks have been controlled, the treatment has to be continued, since interruption might precipitate recurrence of the attacks.

(Authors' abstr.)

The Relationship of the Vegetative Nervous System to Anginal Anxiety.

What is the biological meaning of anxiety?

Anginal anxiety is to be considered as an irritation to certain "vegetative" structures within the diencephalon. From the clinical viewpoint it is comparable to physiologic sleep, which also is dependent upon excitation of certain portions

within the diencephalon, along the axis of the brain and adjacent to the ventricles. During the sleep there are numerous signs of parasympathetic hyperactivity. In anxiety the sympathetic tone is prevailing, although not to the exclusion of the antagonist system. During sleep restorative processes due to parasympathetic impulses are promoted. During anxiety the opposite effect is to be assumed, resulting in extreme weakness and prostration.

The irritation, confined primarily to the vegetative diencephalic centers and to the sympathetic fibers, may spread to the vagus. After the use of adrenalin, i.e., after sympathetic stimulation, ventricular flutter and sudden death, due to abrupt standstill of the heart, have been reported, the increased sympathetic tone causing vagal inhibition by reflex. This is the other biologic aspect of anginal anxiety.

The considerations in this article confirm the stand taken elsewhere regarding the relationship of the vegetative nervous system to angina pectoris abdominalis (L. Hess). In both conditions, in angina pectoris abdominalis and in anginal anxiety, the vegetative system is involved. It seems likely that even the primary site may be located outside the heart, within the centers of the vegetative nerves. In angina abdominalis, the vagus plays an important role; in anxiety, we are confronted with the predominance of sympathotonic features.

(Author's abstr.)

Results of Repetition of Electroencephalography in Adult Epileptics.

For 140 adult epileptic patients (100 idiopathic, 40 symptomatic) electroencephalography was repeated after an interval of five to seven years, under essentially the same anticonvulsant treatment.

Among idiopathic epileptic patients the subsequent electroencephalogram was the same in 85 per cent., worse in 10 per cent. and better in 5 per cent.

Among symptomatic epileptic patients the subsequent electroencephalogram was the same in 95 per cent., worse in 2.5 per cent. and better in 2.5 per cent.

Since only where the subsequent electroencephalogram was improved might the incidence of abnormality be lowered, it was evident that in the idiopathic group there was only a 5 per cent. chance that this might occur had electroencephalography been done at another time, whereas for the symptomatic group this was a 2.5 per cent. chance.

It was concluded that a single electroencephalogram taken at any one time has a 95 to 97.5 per cent. likelihood of representing the true electroencephalographic non-convulsive state of an epileptic adult, under unchanging therapy, and is, therefore, extremely reliable.

(Author's abstr.)

DECEMBER.

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Study of Electroencephalographic Findings in 209 Cases Admitted as Head Injuries to an Army Neurological-Neuro-Surgical Center.

(1) Electroencephalographic abnormalities are apparently a valid indicator of brain injury.

(2) The percentage of electroencephalographic abnormality increases with severity of injury. It is most marked when the dura has been penetrated, less in cases of open head injury without dural penetration and least in closed head injuries.

(3) The percentage of electroencephalographic abnormality decreases as time elapses from injury.

(4) Amplitude asymmetry is a guide to site of injury and an index of electroencephalographic improvement.

(5) Focal records were not found in cases with mild injury, but were more frequent with severe injury and penetrating wounds, and in our series occurred relatively soon after injury (under six months). Focal records without accompanying convulsions were found almost entirely in cases that had been injured less than six months before the initial electroencephalogram. Focal records with convulsions occurred in cases where the initial record was taken longer than six months after injury. This suggests the possibility that cases with focal records may eventually develop post-traumatic epilepsy, though initially asymptomatic.

(6) There is a suggestion that electroencephalographic improvement may occur after insertion of tantalum plates over skull defects. This may be due either to the healing influence of time or to a specific effect on the plate itself.

(Authors' abstr.)

A Preliminary Study on the Use of Methedrine in Psychiatric Diagnosis.

Fifteen to 20 mgm. of methedrine, given intravenously, produced definite effects in five patients with various psychiatric disorders. The vascular responses, namely, increase in arterial tension and ventricular slowing, occurred typically in each instance. No toxic manifestations were observed, although the patients complained of insomnia on the night following the injection.

The drug made all patients become more talkative; some disclosed previously unobtainable material. In several cases emotional outbursts occurred. In one instance paranoid delusions, previously expressed but more recently concealed, were released.

Conclusion.—From this preliminary study it is suggested that methedrine may have a place in the armamentarium of psychiatric diagnostic methods.

(Authors' abstr.)

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Morphologic Changes in the Brain of Monkeys following Convulsions Electrically Induced.

Electrical currents similar in type, intensity, duration of current flow and frequency with that used in human electric shock therapy, may cause morphologic changes in the central nervous system of monkeys.

The nerve cell alterations are mostly of the reversible type. The changes are mostly related to circulatory disturbances and increased permeability of the blood vessel walls. The latter is shown by distension of the perivascular spaces and perivascular edema and by some diapedesis of form blood elements. Compound granular corpuscles filled with presumably hematic pigment and free pigment in the blood vessels seem to confirm such an occurrence.

When more intense current and of longer duration is applied, occasional minute petechial hemorrhages result. This seems to support the contention that the severity of the lesions are proportional to the intensity of the electrical current, the duration of the current flow and, to a lesser extent, to the number of electric shocks.

The histopathologic changes are more pronounced in the areas of tissue traversed by the main path of the current.

In comparing the slight morphologic changes in experimental animals with

those encountered in control animals, it is necessary not only to evaluate them qualitatively but also quantitatively.

Reversible chemical or structural changes, and possibly some permanent slight structural damage may be at the base of the temporary alterations in the mental processes occurring in patients in the course of electric shock therapy.

(Authors' abstr.)

Experimental Arteriosclerosis in the Nervous System.

Experimental cholesterol arteriosclerosis in rabbits, caused by a diet of milk, yolk powder and yolk cake, supplemented by pure cholesterol in some cases, showed an involvement of the nervous system. Foam cells were found in the vascular tissue of the choroid plexus in all cases, and in the capillaries of the suprachiasmatic region in five out of 17 animals. In four cases the ependymal lining of the third ventricle was distorted or dissociated. The leptomeninx, too, showed occasionally foam cell aggregation, the source of which could not definitely be determined.

In peripheral nerves, foam cells were found between the nerve fibers. The problem of their origin is discussed. In two other cases axons had become swollen, fragmented and strongly basophilic. No explanation is given for this alteration.

It is believed that an endotheliopathy is the primary lesion in experimental cholesterol arteriosclerosis.

The pathological changes in experimental cholesterol arteriosclerosis of the central nervous system seem related to the hemato-encephalic and hemato-cerebrospinal fluid barrier.

(Author's abstr.)

Acetylcholine-Induced Depression of Cerebral Cortical Activity.

Application of acetylcholine to the cortex causes a depression of electrical activity of the cortex. This depression is a cortical phenomenon independent of systemic effects of acetylcholine. Decrease of electrical activity is associated with decreased cortical responsiveness. The depression spreads over the cortex, probably in linear fashion. While the depression induced by acetylcholine occurs prior to acetylcholine discharges, the diminution of activity does not always presage increased activity.

(Authors' abstr.)

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- *Competitive Reinnervation of Rat Muscles by their Own and Foreign Nerves. *Weiss, P., and Hoag, A.* 413

Presence and Action of Acetylcholine in Experimental Brain Trauma.

1. As a result of experimental trauma to the head, ACh is consistently present in the C.S.F. in estimable quantities, 2.7 to 9.0 gamma per cent. within a few hours of injury. The abnormal amounts of ACh may be detected for as long as 48 hours following trauma, after which the time concentration falls below the sensitivity of the test object. The abnormal presence of ACh is presumed to be due to an excess production or release of the substance, an insufficient destruction, and consequent persistence within the intercellular spaces. It has been suggested that such persistent ACh be termed "free ACh."

2. The EEG of a number of cats and dogs have been studied for varying periods of time following trauma. Confirmation for both the previously described intense neuronal discharge and the transient flattening of all recorded electrical activity

has been obtained. Following these effects, there occurs a prolonged period of abnormality in one or both hemispheres. The abnormalities are essentially paroxysmal, high amplitude sharp waves with frequencies varying from 6-7 per second to 16-20 per second.

3. Changes in behaviour include tonic-clonic seizures, apnoea, and loss of ocular and corneal reflexes followed by partial or complete loss of hopping and placing reactions, sense of equilibrium, orientation, and a stuporous condition for varying periods of time of from hours to days.

4. The EEG patterns and the stuporous condition may be abolished by appropriate doses of atropine sulphate.

5. ACh perfused over an exposed area of cortex produces high amplitude sharp waves in small physiological concentrations, 1 gamma per cent. or less, and a flattening of recorded cortical potentials in high physiological concentrations, 2 gamma per cent. or more (depending upon the depth of general anaesthesia).

6. The intracisternal injection of ACh in amounts ranging from 0.02 to 10.0 gamma produces similar behavioral and EEG changes as previously noted, i.e., transient flattening with high concentrations and paroxysmal, high amplitude sharp waves of varying frequencies with low concentrations.

7. The EEG and behavioral effects of intracisternal ACh may also be abolished with appropriate doses of atropine sulphate.

8. It is suggested that "free ACh" may be one of the physiological factors underlying the acute paralytic and excitatory phenomena of cerebral concussion and more severe craniocerebral injuries. (Author's abstr.)

The Relation of Electric Potential Changes to Contracture in Skeletal Muscle.

Experiments were performed on nerve-muscle fibre preparations of the M. adductor longus and on whole isolated sartorius muscle of frogs (*Hyla aurea*). Contractures were set up by constant current pulses and by application of drugs.

1. Negative potential changes are always recorded at the site of origin of contractures in isolated muscle fibres.

2. Contractures, like propagated muscle responses, are initiated, after a sufficient depolarization of the muscle membrane. Contractures may arise: (i) Following on muscle impulses, which may gradually fail to propagate fully from the region of their origin. In these preparations a transition can be detected from normal to "abortive" impulses and to a maintained negative potential change which may give rise to contractures without appreciably exceeding the potential level at which the preceding propagated responses had been set up; (ii) not preceded by propagated responses following on the depolarizing action of drugs or currents in fatigued narcotized or injured muscles.

3. Contractures set up by chemical application are actively maintained by the depolarizing action of drugs. This action is analogous to the "cathodic shortening" effect which lasts for the duration of the current flow. "Chemical" or "electrical" contractures can be graded, depending on drug concentration or current strength.

4. Relaxation of chemically produced contractures can be effected at the anode of constant currents.

5. Novocaine does not raise the threshold at which contractures are set up by constant currents or by potassium application. The apparent threshold for brief shocks, however, is greatly increased. The electric time constant and the resting potential of the muscle membrane is not significantly affected.

6. The connection between the muscle membrane and the contractile elements is discussed. It is suggested that the action currents which accompany depolarization or the propagated muscle impulse are not the essential link in the transmission of "excitation" from the membrane to the contractile elements.

(Author's abstr.)

Righting and other Postural Activity in Low-decerebrate and in Spinal Cats after d-Amphetamine.

Righting and other postural activity was observed in low-decerebrate cats, and in spinal cats, after the intraperitoneal injection of d-amphetamine sulphate, usually in a dose of 10 mg./kg. In the decerebrate cat the righting activity consisted of elevation of the head and shoulders from the surface upon which the cat

was lying and of movements of the fore- and hind-legs, rump, and tail which resulted in incomplete righting of the body. The tail rotated in a manner suitable to promote righting. In spinal cats similar righting movements were observed in the hind-legs, rump and tail.

Asymmetry of body contacts is essential for righting activity in the decerebrate cat under the influence of d-amphetamine. In spinal cats after d-amphetamine, righting activity does not appear unless there is asymmetry of body contacts plus additional tactile stimulation of the lateral aspect of the hind knee, which is next on the table.

The authors' data indicate that, in addition to the previously known centers in the mid-brain, there are centers for righting caudad to the mid-brain, i.e., in the pons, medulla, and even the spinal cord. (Authors' abstr.)

Stimulation with Minimum Power.

An exponentially rising current will stimulate nerve with least power. Such waves are not easily generated. A square wave of correct intensity only requires 22 per cent. more power, and is easily generated. The exponentially falling current obtained from thyatron stimulators requires 85 per cent. more power than the best current form. The use of square waves for stimulators and electric shock therapy is indicated. (Author's abstr.)

Responses of Single Human Motor Units to Electrical Stimulation.

1. The responses of single human motor units to stimulation with instantaneously or slowly rising currents are demonstrated.
2. Accommodation curves with the electrical response of a single motor unit as index were determined and are compared to those given by a muscle twitch.
3. The duration of the motor unit responses to constant currents of various strength—the so-called adaptation time—was determined. Significant differences were found to exist for the proximal and distal parts of the same fibre, the former showing a longer adaptation time. (Authors' abstr.)

Natural and Artificial Activation of Motor Units: A Comparison.

The activation of motor units evoked by voluntary innervation and by electrical stimulation of the motor nerve has been studied in certain human muscles.

1. Stimulation with slowly rising currents has made a separate study of motor units of different thresholds and spike sizes possible. A typical experiment, involving the response of three different units to linearly rising currents of different gradients and strengths and to constant currents of different strengths, is described.
2. The recruitment of motor units to nerve stimulation with very slowly rising currents has been shown to be similar in certain respects to that found during sustained voluntary contractions.

(a) Both types of contraction start with a unit of small amplitude, followed by units of progressively larger spike size. The electrical stimulation experiments, as well as some with selective blocking of the motor nerve during voluntary innervation, indicate that the initial small spikes from the muscle correspond to activity in low threshold nerve fibres. The factors determining muscle spike size are briefly discussed.

(b) In most experiments the units appearing in a particular order during a voluntary contraction are identical with those recruited in the same order by electrical stimulation.

(c) The initial discharge frequencies of identical units at thresholds in both contractions are about the same. The increase of frequency during increased contraction exhibited by a given unit when the next in the sequence appears is also the same in both cases.

The results are discussed in the light of the theories of central excitation, and special attention is directed to the parallelism between the thresholds of different motoneurons during peripheral stimulation and central excitation. (Authors' abstr.)

Competitive Reinnervation of Rat Muscles by their Own and Foreign Nerves.

The problem of whether the original motor fibers of a muscle have any advantage over any other motor fibers in reinnervating that muscle was investigated by letting

the tibial and peroneal nerves compete for reinnervation of the denervated plantar extensors. In 14 white rats the proximal tibial and peroneal stumps were joined to the distal tibial stump only. The junction was effected by means of a Y-shaped sleeve consisting of the reversed posterior end of the aorta, with the two iliac arteries serving as inlets for the two proximal nerves and funnelling the regenerating fibers into the common aortal trunk, which contained the distal tibial stump. Fibers from both sources thus travelled side by side and arrived in the muscles together.

After regeneration was completed, isometric tensions of the plantar extensors in response to supramaximal stimulation of the two nerve sources were determined. The results proved that the fibers from both sources had reinnervated the muscles at random, and the original supply had no systematic advantage over the fibers of foreign origin. In half of the cases the original nerve innervated a greater share of the muscle fibers, and in the other half the foreign nerve took the greater share. The statistical average of all cases shows both sources to be of equal weight. The concept that there is any selectivity, absolute or relative, in the establishment of regenerative connections between motoneurons and muscle fibers is therefore contradicted by the facts.

The experiments have also brought further confirmation of the fact that a single muscle fiber in general does not accept innervations from more than one motoneuron.

(Authors' abstr.)

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- *Centrifugal Functional Deterioration of Asphyxiated Motor Nerve within the
Neural Axes. *Groat, R. A., and Koenig, H.* . . . 463

Facilitation and Inhibition of Spinal Motoneurons.

Facilitation and inhibition, by the direct actions of primary afferent fibers, of two-neuron-arc reflexes has been examined by experiment.

An afferent volley, in group 1 fibers arising in one head of a muscle, facilitates the action of its synergists and inhibits the action of its antagonists. Details of the distribution of these actions are presented elsewhere.

The temporal characteristics of facilitation and inhibition have been defined. Facilitation is maximal on the occasion of synchronous convergence of "conditioning" and "test" volleys, and decays exponentially along a curve falling to $1/e$ in approximately 4.0 msec. duration, thereafter decaying in the same manner as facilitation.

Reasons are given for supposing that the facilitation described here is the expression of a process additional to the detonator action of earlier descriptions. Accordingly it may be called "residual facilitation."

The assumption of two excitatory events, detonator action and residual facilitation, makes no demand for elementary processes unknown in peripheral nerve. Their existence is predicted by the nerve-block model of synaptic transmission, only the significance of the latter, as far as the central nervous system is concerned, having remained in doubt in the absence of demonstration. The functional importance of residual facilitation has now been established.

According to present evidence it is permissible to assume a correlation between residual facilitation and the "synaptic potential" of Eccles.

Residual facilitation and inhibition are regarded as functional opposites, they being similar in all known characteristics excepting direction.

Of many possible factors, three—detonator action, residual facilitation and inhibition—have received sufficient documentation to necessitate inclusion in theoretical consideration of the known properties of synaptic transmission.

Reason is given for supposing that the brief facilitation periods evident in appropriately designed experiments do, as had been supposed, measure the effective duration of the detonator action.

(Author's abstr.)

Integrative Pattern of Excitation and Inhibition in Two-neuron Reflex Arcs.

An afferent volley arising in the nerve of a given muscle of muscle fraction has, by direct impingement upon motor nuclei, the following actions :

1. If above threshold it discharges motoneurons that supply that muscle or muscle fraction ; otherwise, excitation is subliminal.
2. It facilitates the action of motoneurons that supply the muscle remainder, or synergists, at the same joint.
3. It inhibits the action of motoneurons that supply antagonists at the same joint.

The afferent volley in question, by direct action, neither excites nor inhibits motoneurons of muscles, flexor or extensor, that act at neighbouring joints.

In every instance the actions described are in strict accord with the requirements of reciprocal innervation.

The origin and distribution of excitation and inhibition so evoked indicate the role they play in myotatic reflex performance.

The mutually dependent muscles of a joint, together with the direct reflex paths that bind them, may be considered as constituting a myotatic unit.

The myotatic units in the first instance are independent one from another. Two-joint muscles form peripheral bridges between adjacent myotatic units.

Without the necessity for other than direct reflex connections, the myotatic unit exhibits, complete within itself, the elementary mechanism of reciprocal innervation. (Author's abstr.)

Reflex Control of the Ciliary Muscle.

In cats under nembutal anesthesia, faradic stimulation of a peripheral nerve or of the skin of the snout elicited a dioptric change in the direction of hypermetropia both before and after sympathetic denervation of the eye. Complete atropinization of the eye with resulting depression of cholinergic fibers did not abolish this response. It was abolished, however, when the oculomotor nerve was severed intracranially and when the adrenergic fibers were depressed by means of intravenous administration of ergotoxine phosphate.

Intracranial stimulation of the oculomotor nerve caused a dioptric change in the direction of myopia following depression of the adrenergic nerve fibers with ergotoxine phosphate, while identical stimulation of the oculomotor nerve following complete atropinization of the eye, with depression of cholinergic nerve fibers, resulted in a dioptric change in the direction of hypermetropia.

These results seem to indicate that reflex inhibition of the ciliary muscle is an actively integrated and controlled reaction mediated through the parasympathetic innervation of the eye, which involves the efferent conduction of impulses from the ciliary ganglion to the ciliary muscle through adrenergic components of the short ciliary nerves.

In human subjects mild faradic stimulation of the skin of the forearm or of the finger tips elicited a dioptric change of small magnitude in the direction of hypermetropia in untreated eyes as well as during cycloplegia produced by instillation of homotropine into the conjunctival sac, with resultant depression of cholinergic fibers.

The reflex control of the ciliary muscle appears to be mediated exclusively through its parasympathetic innervation. (Authors' abstr.)

Cortico-cortical Connections in the Monkey with Special Reference to Area 6.

1. Afferent cortical connections to area 6a have been described for the first time from areas 46 and 5 + 7 of the lateral hemispherical surface, areas 41 and 42 of the temporal lobe, and areas 7, 23b and 24 of the medial surface of the macaque brain by the method of physiological neuronography.

2. Additional observations on homolateral inter-areal connections have been made, including afferents to many of the suppressor regions. (Authors' abstr.)

Centrifugal Functional Deterioration of Asphyxiated Motor Nerve within the Neural Axis.

By means of placing stimulating electrodes along the intramedullary portion of the facial nerve and observing electrical thresholds before and after clamping the trachea, it has been shown that asphyxial deterioration of the nerve begins in

the nucleus and extends progressively distalward with time. These results complement the previous finding of a proximo-distal deterioration gradient along the medial popliteal nerve and contributing ventral roots, and with it establish the existence of a gradient along the entire length of living motor nerve.

(Authors' abstr.)

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*Hypnotic Suggestion in PK Tests. *Rhine, J. B.* 126

Hypnotic Suggestion in PK Tests.

In tests of psychokinesis (PK), 5 male subjects were tested individually in procedure which involved the mechanical release of 96 dice at a time. Each subject made 20 throws of the 96 dice in the prehypnotic control session. Then "each subject was hypnotized and told that he would try very hard to make the specified target face turn up when he released the dice and that he would be able to influence them by his concentrated effort." The subjects were then retested, with the result that their scores were far below those of the control session. "With two subjects, however, it was found that an incidental break in the hypnotic spell brought about a reversion to high scoring." Thereafter, when other subjects scored low in the post-hypnotic session, they were rehypnotized and told that they would do further tests in a spirit of fun and relaxation. These subjects then produced scores higher than those of their control session. There were significant differences between the scores of the first post-hypnotic section and the other sections of the data.

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Electroencephalographic Studies of Mental Fatigue.

1. Twenty-six medical students and one professor were examined before the beginning of a typical day of classes and at the end of it. Electroencephalograms were taken, together with physiological variables, such as blood sugar, susceptibility to hypocapnia, white blood picture, etc.

2. Of the 23 persons having alpha waves, seven showed loss of alpha and four increase of alpha time. Statistical analysis shows that loss of alpha, claimed as an electroencephalographic evidence of mental fatigue, was not significant.

3. The susceptibility of the EEG to deep breathing was twice as great at 8 a.m. as it was at 5 p.m.; when corrections were made for blood-sugar level, vital capacity, and evidence of peripheral vasoconstriction.

(Authors' abstr.)

Effects of Electro-convulsive Shocks on "Reasoning" Ability in Albino Rats.

Evidence based on data from six adult rats indicates that electro-convulsive shocks alter and impair the performance of rats in the Maier "reasoning" test. The amount of disturbance appears to be inversely related to the length of the period of recovery after individual shocks. Suggestions have been given for further investigations which may shed considerable light on the influence of convulsive shocks on cognitive functions in infra-human subjects.

(Authors' abstr.)

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On the Nature of Fear.

(1) Anthropoid fears of inert, mutilated or dismembered bodies are spontaneous—that is to say, although experience of a certain kind is a pre-requisite and learning is definitely involved, the avoidance of such objects is not built up by association with a more primitive cause of fear.

(2) These and a number of other fears are evidently not determined by a sensory event alone, and the behavior is not intelligible except on the assumption that its control is a joint product of sensory and "autonomous" central processes. Consequently no amount of analysis of the stimulating conditions alone can be expected to elucidate the nature of fear, or to lead to any useful generalization concerning its causes.

(3) An adequate hypothesis of the nature of fear cannot be framed in psychological terms alone, but must utilize physiological concepts of cerebral action. No common psychological ground can be discovered for all the various causes of fear. What is there in common, for example, between the characteristically high level of the auditory and low level of visual stimulation which induces fear in children, or between fear of strangers, which decreases, and fear induced by pain, which tends to increase, with repetition?

The hypothesis developed here has made a considerable synthesis of formerly unrelated facts, although it remains vague on some crucial points. It proposes, in brief, that fear originates in the disruption of temporally and spatially organized cerebral activities; that fear is distinct from other emotions by the nature of the processes tending to restore cerebral equilibrium (that is, *via* flight); and classifies the sources of fear as involving (1) conflict, (2) sensory deficit or (3) constitutional change. By distinguishing between processes which break down and those which restore physiological organization in the cerebrum, the variability of fear behavior is accounted for.

The conceptions of neurophysiological action on which this is based were developed originally as an approach to other problems, and will be presented in detail elsewhere. When this is done, and the neurophysiological implications are made explicit, it may appear that a basis has been laid at last for an adequate theory of emotion and motivation—something which is lacking in psychology at present.

(Author's abstr.)

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Studies on the Nature of Certain Symptoms Associated with Cardiovascular Disorders.

Day-to-day studies were made over a period of almost a year of the symptoms and cardiovascular and respiratory functions of healthy human subjects, and short term observations were made on selected patients.

Emphasis was placed upon reactions to persistent low-grade stresses and strains which are a part of "every day" living and which constitute the core of the bedside problem rather than upon the well-known responses to major life crises. These studies have revealed the following:

1. Dyspnea associated with inefficient pulmonary ventilation may occur in

response to stress-producing life situations in association with anxiety, anger, guilt, rage, frustration, and tension.

2. Palpitation associated with increased stroke volume may occur under similar circumstances.

3. Heart pain in the presence of anatomical narrowing of the coronary arteries may result from increased work of the heart attendant upon prolonged elevation of the blood pressure and cardiac output in association with rage, resentment, anxiety, fear, and tension.

4. Heart pain in the presence of anatomical narrowing of the arteries may result from a fall in the cardiac output and coronary blood flow in association with desperation and defeat.

5. Giddiness and faintness may result from cerebral anoxia attendant upon diminished venous return to the heart. Also, giddiness and faintness may result from hyperventilation, which is followed by cerebral vasoconstriction, impaired dissociation of oxyhemoglobin and cerebral anoxia. Both type of cerebral anoxia occur in response to stress-producing life situations in association with feelings of exhaustion, anxiety, fear, and during the early part of convalescence.

6. Fatigue, as experienced by patients is a complex state dependent upon emotional attitude, the absence of a dominant motivation and the presence of a stress-producing life situation with accompanying inefficiency of cardiovascular and respiratory function.

7. Individuals differ as regards the intensity and duration of the cardiovascular and respiratory responses to life situations. The fact that a single subject tends to react under different circumstances in many different ways suggests that the individual is manifesting a variety of ways of dealing with his environment as regards his cardiovascular and respiratory functions.

8. These results indicate that, in a setting of adverse life circumstances and associated emotional reactions, performance in terms of respiration and work of the heart is costly. This high cost may manifest itself in cardiovascular symptoms which are not dependent alone upon gross structural heart disorder. This unecological performance may also manifest itself in impaired total efficiency of the individual.
(Authors' abstr.)

An Electrocardiographic Study of Psychoneurotic Patients.

The mechanism of non-specific electrocardiographic abnormalities observed in normal, psychotic and neurotic individuals is still not entirely understood. It is generally accepted, however, that the deviations from the normal are associated with an imbalance in the autonomic nervous system. The appearance of these abnormalities is apparently independent of the degree of nervous imbalance, since in only a relatively small percentage of cases with psychoneurotic cardiac dysfunction do these occur. Mainzer and Krause showed that an emotion such as fear before an operation produced changes in the electrocardiogram strongly suggestive of transitory coronary insufficiency. When consciousness was depressed by anaesthesia the electrocardiographic record reverted to a normal pattern. This observation was interpreted by them as indicating the marked influence the autonomic nervous system has on the coronary circulation. They suggested that vagal influence was dominant in decreasing the coronary flow. Since, however, there is no unanimous agreement among workers as to the precise action of the sympathetic and parasympathetic supply on the coronary circulation, it would appear hazardous to insist that the essential action of psychic impulses to the heart is directed precisely upon the coronary flow. Furthermore, in all published reports on this problem, as well as in the present investigation, no combination of abnormalities suggestive of a myocardial infarction pattern was observed. It would appear, rather, that the psychic impulses to the heart may act upon any of its elements, producing in this way non-specific deviations from the normal pattern. Further evidence to support the view of the effect of autonomic imbalance on the cardiac mechanism was presented by Wendkos, using vagolytic and sympatholytic drugs on normal individuals having an inverted T wave in lead CF₂ of the electrocardiogram. Earlier observations of the effect of emotion on the electrocardiogram contribute little towards a better appreciation of the use of this instrument in differentiating benign from organic heart disease. Since anxiety is the central symptom of nearly all neuroses and psychoses, and all fears either apparent or

obscure form the essential component of the psychoneurotic states, it would appear that the electrocardiographic abnormalities noted in such cases may be attributed to inherent fear reactions.

In an electrocardiographic study of 1,000 young aviators, Graybiel *et al.* found that P waves with an amplitude of 2 mm. or greater occurred in 2.1 per cent., and 0.5 per cent. of their records in leads II and III respectively, and none in lead I. In the present report P waves of the same amplitude occurred in 3.9 per cent. of the records in lead II, and 0.7 per cent. of the cases in leads II and III. In ten instances, tall P waves were associated with small upright or diphasic QRS complexes in lead I, tall QRS complexes in leads II and III, with a slight S-T depression in lead III, giving the impression of a right heart strain pattern. It is well known that persons with asthenic body builds, low diaphragms and small hearts show a right axis shift pattern in the electrocardiogram. In the present study only 60 per cent. of the patients with neurocirculatory asthenia had this type of body habitus, and only one-third of this group had right axis shift. This has been the experience of other workers in this field.

Graybiel *et al.* showed that deep S₂ waves greater than 4 mm. occurred in 2.4 per cent. of their records, while Hall *et al.* on a similar study of 2,000 young aviators, found S₂ greater than 3 mm. in 20.7 per cent. of their records. In the present investigation, the presence of deep S₂ waves was observed in only 1.5 per cent. of the records. This suggests that the occurrence of a deep S₂ wave alone, unassociated with other well-defined abnormalities in the electrocardiogram, should be regarded as an individual variation and not indicative of myocardial damage.

Flat or small T waves in leads I and II occurred in 5.3 per cent. of the present series of records. Graybiel *et al.* reported inversion of T₂ in 0.2 per cent. of their records in a large group of healthy individuals, and Hall *et al.* in a similar study observed this abnormality in 0.3 per cent. of their cases. Graybiel and White reported seven cases of neurocirculatory asthenia, known to be free of organic heart disease, showing inverted or flat T waves in leads I and II. According to these workers there was no evidence in these cases to indicate inadequacy of the coronary circulation to explain the abnormality in the T wave. White *et al.* observed T₂ inversions occurring occasionally in persons with asthenic habitus and vertical hearts. They suggested that this electrocardiographic abnormality may be produced either by variation in position of the heart, depression of the diaphragm or by overventilation resulting in alkalosis. Barker *et al.* reported that alkalosis decreased and acidosis increased the amplitude of the T waves in the limb leads, and believed that abnormal T waves produced by voluntary hyperventilation may be due to alkalosis. When they induced alkalosis by feeding large quantities of sodium bicarbonate (25 to 50 gm.) to normal patients, they were able to produce in 5 out of 7 cases similar T wave changes. However, they were unable to show a strict parallelism between the pH of the blood and the electrocardiographic changes. Thompson explained the T inversions found in tracings of patients with anxiety neurosis and the hyperventilation syndrome as being due to alkalosis. He believed that smoking may produce similar changes by deep inspiration, contrary to the view of Graybiel *et al.* that flattening or inversion of the T waves in the limb leads are due to the toxic action of nicotine. Scherf and Weisberg presented convincing evidence showing that the alterations in the T waves may be attributed to the diaphragm during respiration. Logue *et al.*, from a study of 74 cases of neurocirculatory asthenia, reported 30 per cent. of their records showing low T waves. In a recent report, Loftus *et al.* studied a series of 41 cases with anxiety neurosis, with only 2 cases (5 per cent.) showing low amplitude of the T wave in leads I and II, which is in close agreement with the findings of the present investigation. Their other 39 cases apparently showed no electrocardiographic deviations from normal, in spite of the marked personality disorders, which is significant. Other workers have observed transient T wave inversion in lead II following a paroxysmal ventricular tachycardia in patients without psychoneurotic personality patterns.

T wave inversions in the precordial leads were not observed in the present investigation. Wendkos reported T inversions in CF₂ in 4 cases of neurocirculatory asthenia and ascribed this change to a preponderance of either the vagal or sympathetic tone—not to the position of the heart, since the stability of the inversions was unaffected by postural changes. Logue *et al.* recorded 3 per cent. of their cases having the T wave inverted in lead CF₂. Inverted T waves in lead CF₂,

having the characteristic feature of a long descending and short ascending limb, have been commonly observed in normal infants' and children's electrocardiograms. Occasionally similar T inversions in this lead have been noticed in young, healthy adults and their occurrence has been ascribed to the residual qualities of the juvenile heart; for that reason, it is not a characteristic feature of autonomic imbalance in psychoneurosis.

S-T segment depressions occurred in 8 per cent. of the present series of records. This abnormality has been frequently observed following shock treatment and in electrocardiograms of emotionally unstable individuals. However, the degree of deviation of the S-T segment from the reference level, or how commonly this abnormality occurs, had not been recorded. While 36 per cent. of the present records reveal S-T depressions in the limb leads, actually only 8 per cent. of these showed depressions of at least 0.5 mm. in leads I and II, and 0.75 mm. in lead III, taking the P-Q segment as the reference level. Graybiel *et al.* found 0.9 per cent. of their records of 1,000 normal aviators showing a mean S-T junction depression of 0.64 mm. in lead I, 1.2 per cent. of the records with a mean depression of 0.46 mm. in lead II, and 7.7 per cent. with a mean depression of 0.33 mm. in lead III. Since S-T depressions occur in a variety of electrocardiographic patterns indicative of disease involving various cardiac elements, the significance of this abnormality in benign cardiac dysfunctions is difficult to evaluate. It is significant, however, to note that this abnormality occurs at least six times more commonly in patients with personality disorders than it does in normal individuals under the age of 40 years. (Authors' abstr.)

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Organ Function and Form Perception.

The Rorschach records of two groups, each consisting of 60 patients, were compared. One group, designated as V group, was picked for the common feature of arterial hypertension. The other group, designated as L group, was composed of 30 cases of chronic arthritis and 30 cases of Parkinsonism.

The two groups showed specific preferences for certain types of responses which made it possible to distinguish between an L type and a V type of response. The critical responses could be subsumed under 4 general categories. In all 120 patients the number of responses of their own type exceeded the number of responses of the other type in at least two categories. The four categories and the differences between the two groups are as follows:

1. Vertical axis.

(a) Location: Patients of the L group had a much greater tendency to center one-half or more than one-half of their responses in the axis than the V group.

(b) Form: Patients of the V group saw the axial part as an opening about five times more often than the L group.

(c) Content: Warm-blooded organisms and dynamic emphasis centred in the axis were observed more often in the L group than in the V group. The V group saw more anatomical structures, ritualistic objects, and water and fire than the L group.

2. Kinesthetic responses: Goal-directed activities were indicated more often by the L patients, while actions determined by convention or by efforts to maintain a certain position were indicated more often by the V patients.

3. Integration and disintegration: The tendency toward integration of the ink-blots into a comprehensive interpretation was more pronounced in the L group, while the tendency toward disintegration was more pronounced in the V group.

4. Animals: Eagles and pigs were most frequently seen by the L group, while cows, sheep and beasts of prey were most frequently seen in the V group.

The psychological interpretation of the findings suggested that arthritic and Parkinsonian patients are dominated by an urge for individualistic, independent

action. Obstacles are liable to provoke aggressiveness in excess of the chances for success. Patients suffering from arterial hypertension have a tendency toward dependent relationships in form of identification with their social environment. Action is determined by material needs and by social standards. Obstacles easily provoke conflicts between dependent and aggressive impulses, resulting in restriction of the range of action and of perception.

Specific correlations between organ dominance, disease liability and form of perception were discussed. They gave added insight into the physiological basis of the Rorschach method and of physiognomical understanding.

The discovery of two gestalt tendencies associated with individualistic and with collectivistic personality types suggested the possibility of making current personality and aptitude tests more reliable, and the possibility of further extending the use of the Rorschach method. (Author's abstr.)

The Sleep of Patients with Manic-Depressive Psychosis, Depressive Type: An Electroencephalographic Study.

(1) The entire night's sleep of 6 patients with manic-depressive type, was studied electroencephalographically and compared with data similarly obtained from normal subjects. The categories for the electroencephalograms were waking or daytime and sleep, the latter being subdivided into low voltage, spindles, spindles plus random, and random.

(2) There was considerable variability among the patients in the percentage of time that each electroencephalographic type appeared during the entire night's recording. This variability became less when the waking records were excluded and only the electroencephalographic patterns that occurred in sleep were considered.

(3) In a comparison of the mean percentage of time each electroencephalographic sleep pattern appeared in the sleep records of patients and normal controls, it was found that the patients had almost twice as much low voltage activity as the normal controls (37.5 to 19 per cent. respectively) and approximately one-half as much spindles plus random activity as the normal controls (23 to 40 per cent. respectively).

(4) In a comparison of the minute by minute fluctuations from one electroencephalographic pattern or level to another for the entire night's recording of patients and normal controls, it was found that the fluctuations were more frequent for the patients.

(5) The per cent. of the minutes during the night's sleep which contained two or more of the electroencephalographic sleep levels was nearly twice as great for the patients as for the normal controls (52.7 to 28.5 per cent. respectively).

(Authors' abstr.)

Psychodynamic and Electroencephalographic Factors in Duodenal Ulcer.

Twenty-five cases of duodenal ulcer were studied from a psychodynamic and electroencephalographic point of view. The cases represented an unselected sample of the naval ulcer population. The electroencephalographic data showed a high incidence of dominant alpha activity in this ulcer group. Using the Davis classification for the measurement of normal electroencephalograms, it was found that 76 per cent. of the cases were in the dominant alpha group, 4 per cent. in the subdominant alpha group, and 20 per cent. were in the rare alpha group. Thus there were almost four times the expected number in the dominant alpha group.

The psychological data revealed a rather consistent ulcer personality constellation. Duodenal ulcer individuals were characterized by marked feelings of insecurity associated with strong passive dependent trends. There was usually a marked reaction against these trends with the development of a facade of independence and aggressiveness. The ulcer syndrome seemed to result from the interaction of this personality constellation and the frustrating service environment.

The basic correlation between a dominant alpha rhythm and psychic trends to passivity and dependency appears valid. However, one must not assume any causality between these two aspects of the total organism. The alpha rhythm is best considered as a concomitant electrocortical activity of the tendency of the individual to assume a passive, tensionless, unstimulated state.

(Author's abstr.)

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The Effects of Certain Parasympathomimetic Substances on the Emotions of Normal and Psychotic Individuals.

Desoxycorticosterone acetate and prostigmin methylsulfate were used with some 60 psychotic and neurotic patients and with normal controls. The acetate, an extract of the adrenal cortex, had a somewhat less marked effect than the prostigmin, a synthetic drug. A variety of physiological changes were carefully recorded. The emotional effect was in general relaxing. Under prolonged treatment, several manic patients and schizophrenics became eligible for discharge. A single administration of either substance produced measurable chemical and vascular effects over a period of about four hours.

H. D. SPOERL (Psychol. Abstr.).

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Alterations of Conditioned Reflexes in Old Age.

Observations on a 15-year-old dog who had been subjected to 12 years of experimentation show that, in this animal, trace conditioned responses could not be produced at all. Delayed conditioning could be accomplished only with difficulty. A previously learned discrimination between two auditory stimuli was lost. During the last half year of the dog's life, the conditioned salivary response decreased by two thirds, while the magnitude of the unconditioned salivary response increased markedly. Theoretically, these results are taken to mean that, in senility, the cortical processes of inhibition and excitation are lost in the order named, although subcortical function remains unimpaired. G. A. KIMBLE (Psychol. Abstr.).

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1. Biochemistry, Physiology, Anatomy, &c.

- Studies in Cholinesterase. V. Selective Inhibition of Pseudocholinesterase in vivo.*
Hawkins, Rosemary D., and Gunter, Josephine M. (Univ. Toronto, Can.).
 [Biochem. J., 40, 192-7 (1946).]

The prostigmine analog (dimethyl-carbamate of (2-hydroxy-5-phenylbenzyl) trimethylammonium bromide) inhibits almost completely and selectively the non-specific or pseudocholinesterase. Injections of this compound produce almost complete inhibition of the pseudocholinesterase in the blood and tissues of dogs, but do not produce symptoms suggesting an accumulation of acetylcholine, which appear only when the true or specific cholinesterase is significantly suppressed at the same time. It is, therefore, concluded that the pseudocholinesterase plays no significant part in the *in vivo* splitting of acetylcholine.

S. MORGULIS (Chem. Abstr.).

- Iron Concentrations in Cholinesterase Preparations.* *Barnard, Robert D. (Fox Hills, Staten Island, N.Y.).* [Science, 104, 331 (1946).]

A sample of electric eel material, 1 mgm. of which hydrolyzed 1,200 mgm. of acetylcholine per hour, had an Fe content of 47.3 mgm. per cent.; a serum esterase preparation, which split 20 mgm. of acetylcholine per hour, had 19.8 per cent. of Fe; while a human erythrocyte cholinesterase preparation, with an esterase activity of 7.8 mgm. per mgm./hour, had an Fe content of 9.0 mgm. per cent. This suggests that the Fe either is concentrated along with the esterase fractions or comprises an actual component of the latter. E. D. WALTER (Chem. Abstr.).

- True Cholinesterases with Pronounced Resistance to Eserine.* *Hawkins, Rosemary D., and Mendel, Bruno (Univ. of Toronto).* [J. Cellular Comp. Physiol., 27, 69-85 (1946).]

Planaria (P. dorocephala) have a true cholinesterase which shows increasing activity with rising concentrations of acetylcholine (I) up to 0.006 M. To inhibit its activity to the same extent as that of the specific cholinesterase of mammalian brain or erythrocytes, 50 and 1,000 times the concentrations of eserine and Nu-489 (dimethyl-carbamate of o-hydroxybenzylamine-HCl), respectively, are required. Frog brain has a true cholinesterase with maximum activity at a concentration

of (I) about 0.0006 M and with decreasing activity with greater concentrations. Approximately 100 times the concentration of eserine is required to inhibit activity to the same extent as cholinesterase of mammalian brain. Inhibition of activity by excess substrate cannot be considered a primary characteristic of specific cholinesterases. The ratios of activity toward (I) to activity toward β -acetyl-methylcholine differed markedly for the cholinesterases of *Planaria* and frog brain. Caution must be used in interpreting experiments in which there is lack of potentiation of the effects of nerve stimulation on addition of eserine.

H. L. MASON (Chem. Abstr.).

Changes in the Activity of Cholinesterase of Nervous Tissue Under the Influence of Constant Current. Babitskii, Eug. B., and Minaev, P. F. (*Acad. Med., Moscow*). [*Nature*, **158**, 343-4 (1946); cf. *C.A.*, **40**, 1545⁸, 2212⁷.]

The cathode of constant current lowers the activity of cholinesterase, while the anode produces the opposite effect. This can be explained on the basis of the changes that take place in the distribution of ions in the nerve under the influence of polarization.

E. D. WALTER (Chem. Abstr.).

Mechanism of Action of Cholinergic Substances. III. Moratschek, Johann (*Univ. Berlin*). [*Arch. exptl. Path. Pharmacol.*, **203**, 278-81 (1944); cf. *C.A.*, **35**, 3328⁸.]

In the isolated frog heart acetyl- β -methylcholine chloride (mecholy) and isobutylene trimethylammonium chloride (esmodil) produce a prolonged but gradually diminishing decrease in the beat amplitude. Choline and tetramethylammonium chlorides inhibit this negative inotropic action of mecholy and esmodil. Esmodil acts synergistically with mecholy and acetylcholine.

IV. *Acetylcholine and Choline.* Voigt, Manfred (*Univ. Berlin*). [*Ibid.*, 282-304.]

The action of acetylcholine on the isolated frog heart was studied. The results are in accord with those of other investigators. Choline antagonizes the action of acetylcholine.

L. E. GILSON (Chem. Abstr.).

VIII. *Effect of High Oxygen Pressure on Enzymes; the System Synthesizing Acetylcholine.* Stadie, Wm. C., Riggs, Benjamin C., and Haugeard, Niels. [*Ibid.*, 189-96.]

The aerobic synthesis of acetylcholine by slices or homogenate of rat brain is not affected by exposure to O at high pressure. The choline acetylase of rat-brain slices is likewise unaffected, but cell-free preparations of the enzyme are rapidly inactivated by O. The relation of these findings to the problem of O poisoning is discussed.

L. E. GILSON (Chem. Abstr.).

Effect of Adrenaline and Acetylcholine on Excitation, Inhibition and Neuroses. Gantt, W. Horsley, and Freile, M. [*Trans. Am. Neurol. Assoc.*, **70**, 180-1 (1944).]

In normal dogs having excitatory and inhibitory conditional reflexes and in neurotic dogs, adrenaline (I) impaired the higher nervous functions as measured by the motor, salivary, and cardiac conditional reflexes, while acetylcholine (II) improved the differentiation between the excitatory and inhibitory processes. These effects lasted days or weeks after the injection. In the neurotic animals (I) had a less disturbing effect, and (II) a greater improving effect, than in the normal animals. Both drugs became less effective on repeated injection.

MARION HORN PESKIN (Chem. Abstr.).

Muscular Contraction. The So-called Direct Sensitization of Striated Muscle to Acetylcholine. Scheiner, H. (*Centre études scientifiques homme, Paris*). [*Compt. rend. soc. biol.*, **139**, 1090-2 (1945). Discussion.]

An almost unlimited number of substances sensitize frog muscle to acetylcholine. This "direct" sensitization appears to be related to the existence of some mechanism which is present in vertebrate muscle, but absent in invertebrate muscle.

Sensitization of Striated Muscle to Acetylcholine by Tetrahydrofuryl Alcohol. [Ibid., 1092-5.]

Tetrahydrofuryl alcohol (I) sensitizes frog rectus abdominis muscle to acetylcholine. With concentrations of 0.1-2.5 per cent. the effect is proportional to the concentration. When the muscle is washed it returns to its original state of sensitivity. In this respect (I) differs from eserine, since the sensitizing effect of the latter is not abolished by washing.

L. E. GILSON (Chem. Abstr.).

The Mode of Action of Acetylcholine on Muscle Tissue. Kometiani, P. A., Klein, E. E., and Dolidze, Sh. V. (Georgian Acad. Sci., Tbilissi). [Biokhimiya, 11, 253-62 (1946); cf. C.A., 39, 3361*.]

The specific action of acetylcholine on muscle is due to the transformation of part of the bound K into a form capable of diffusion. Acetylcholine has little effect on muscles with a low degree of excitability. The action of acetylcholine is associated with the physico-chemical state of the cytoplasmic substrate to which the K is bound.

H. PRIESTLEY (Chem. Abstr.).

Reaction of the Sympathectomized Dog to Histamine, Acetylcholine and Peptone. Bennati, D., and Bacq, Z. M. (Facultad de med., Montevideo). [Arch. soc. biol. Montevideo, 12, 211-15 (1945) (Pub. 1946).]

Sympathectomized dogs are hypersensitive to the action of acetylcholine, histamine and Witte peptone during 26 days after the last operation.

F. FROMM (Chem. Abstr.).

Effect of Alkaloids on Acetylcholine Synthesis. Torda, Clara, and Wolff, Harold G. (Cornell Univ., Ithaca, N.Y.). [Arch. Biochem., 10, 247-50 (1946); cf. C.A., 40, 2211*.]

The synthesis of acetylcholine (I) by minced frog brain in the presence of 3 per cent. physostigmine salicylate was increased 20-150 per cent. on the addition of adrenaline, cocaine, ephedrine, and ergotamine in concentrations of 0.03 to 0.003 mgm. per cent. Yohimbine and pilocarpine did not modify (I) synthesis, whereas veratrine, quinine, quinidine, strychnine, amphetamine sulfate, morphine, codeine, cinchonine, colchicine, d-tubo-curarine and atropine decreased the synthesis of (I).

VERNON L. FRAMPTON (Chem. Abstr.).

Thiamine and Contraction of Leech Muscle Provoked by Acetylcholine. Saviano, Mario (Univ. Naples). [Boll. soc. ital. biol. sper., 17, 21-4 (1942).]

Thiamine does not increase the sensitivity of untreated leech dorsal muscle to acetylcholine, but does increase the sensitivity of eserinizd muscle.

Relation between Cholinesterase and Sensitization to Acetylcholine by Thiamine. [Ibid., 24-6.]

Thiamine does not exert an anticholinesterase action on leech muscle.

L. E. GILSON (Chem. Abstr.).

Influence of Anticholinesterase on Reflexes of Sino-carotid Origin. Heymans, C. (Univ. Gand). [Experientia, 2, 260 (1946) (in French).]

In dogs administration of diisopropylfluorophosphate (DFP) does not affect cardiovascular or respiratory reflexes of carotid sinus origin or the peripheral excitability of the heart vagus nerve. Injection of prostigmine after DFP still induces bradycardia, an increase of vagal excitability, an increase of intestinal peristalsis, and bronchospasm. Thus the theory of central or peripheral cholinergic transmission of cardiovascular and respiratory reflexes induced by stimulation of carotid sinus pressoreceptors is not supported. Several pharmacological actions of prostigmine are not related to the anticholinesterase action of the drug.

WM. M. GOVIER (Chem. Abstr.).

Action of Acetylcholine and Vitamin B₁ on Human Blood Pressure. Rotelli, Luigi (Univ. Pavia, Italy). [Boll. soc. ital. biol. sper., 20, 508-9 (1945).]

In 80 persons the injection of vitamin B₁ caused no alteration in blood pressure, injection of 200 mgm. acetylcholine caused a depression of 10 to 15 mm. Hg and the injection of combined vitamin B₁-acetylcholine produced no effect other than that caused by the acetylcholine.

HELEN LEE GRUEHL (Chem. Abstr.).

Acetylcholine in the Pathogenesis of Peptic Ulcers. Al'pern, D. E. (*Med. Inst. Kharkov*). [*Byull. Eksptl. Biol. Med.*, **20**, No. 7/8, 43-4 (1945).]

More extensive observations confirm the significance of acetylcholine (I) in the formation of gastro-intestinal ulcers. Of 131 patients (I) was found in the blood of 91 per cent. of patients with x-ray-confirmed ulcers, 70 per cent. of patients with other ulcer symptoms, and 3 per cent. of patients recovering from ulcers. It was absent from the blood of 43 patients with non-ulcerous gastro-intestinal symptoms.

K. STARR CHESTER (Chem. Abstr.).

Sensitization of Muscle to Choline and Acetylcholine and the Supposed Existence of Choline Acetylase. Babshii, Eug. B., and Minaev, P. F. (*Acad. Med., Moscow*). [*Nature*, **158**, 268 (1946).]

Nachmansohn and his colleagues (*C.A.*, **39**, 2519⁶) and Feldberg and Mann (*C.A.*, **39**, 4667⁹) have suggested the enzymic synthesis of acetylcholine from choline and acetate in the presence of adenosine triphosphate. The alleged enzyme was named choline acetylase. Repeating their experiments, the authors found that the contraction of rectus abdominis of frogs and of the dorsal muscle of leeches in response to choline is greatly increased by the presence of adenosine triphosphate, this increase depending on the concentration of the latter. The increase of observed muscle contraction may possibly have been due not to the stimulation of acetylcholine synthesis by adenosine triphosphate, but to the sensitizing effect of this substance on the test muscles.

E. D. WALTER (Chem. Abstr.).

The Content of Acetylcholine-like Substances and Cholinesterase in the Central Nervous System of Castrated Rats. Kakushkina, E. A., and Tatarko, T. (*K. A. Timiryazev Biol. Museum, Moscow*). [*Byull. Eksptl. Biol. Med.*, **20**, No. 9, 58-60 (1945).]

The removal of the sex glands of male or female rats did not have significant effect on the formation of acetylcholine-like substances in the cerebrum, but castration did result in a reduction in cholinesterase activity which led to a relative increase in acetylcholine-like substances.

K. STARR CHESTER (Chem. Abstr.).

The Mechanism of Acetylcholine Liberation in Striped Muscles. Abdon, N. O., and Bjarke, T. (*Univ. of Lund, Sweden*). [*Acta Pharmacol. Toxicol. (Copenhagen)* (**1**), 1-17, (1945) (in English).]

Experiments with frog muscles are described. When the muscles are stimulated and contracted, free acetylcholine (I) is liberated from a precursor (II). During the first period the (II) is resynthesized rapidly and no free (I) is found by analysis. The resynthesis requires energy; when available sources of energy are exhausted the amount of (II) decreases and if cholinesterase is inhibited with eserine the liberated (I) accumulates. Oxidative as well as glycolytic processes can give energy for resynthesis of (II). When skeletal muscles are mechanically injured the (II) is broken down and a corresponding amount of (I) is formed. The rate of (I) formation is considerably more rapid than formerly believed. When resynthesis is blocked as far as possible, as in muscles treated with iodoacetate and KCN, the whole content of (II) can be broken down in 2-3 seconds. When normal frog muscles are continuously stimulated in O no breakdown is seen during the first 10 seconds. This means that all the (II) is broken down and rebuilt at least 200 times during this period. Resynthesis is the normal way for the removal of (I) in skeletal muscles. Neither the breakdown nor the resynthesis of (II) is influenced by eserine in a concentration sufficient to inhibit cholinesterase completely (1:50,000). (I) is liberated from (II), whether the muscles are stimulated directly or through their anterior roots. If transmission is blocked with curare, stimulation of the nerves produces no breakdown of (II) and no free (I) appears. Curare does not affect the mechanism for (I) liberation; when curarized muscles are stimulated directly the (II) is broken down just as in normal muscles. These findings are not in full accord with the humoral transmission theory of Dale.

Effect of Vagal Stimulations on the Acetylcholine Precursor in Rabbit Hearts. Abdon, N. O., and Borglin, N. E. [*Ibid.*, 162-8.]

All the acetylcholine (I) of the rabbit heart is present as precursor (II). In the ventricles the concentration is about the same as in skeletal muscles, in the auricles

it is 2-3 times higher. In the heart (II) is the immediate source of liberated (I). After prolonged vagal stimulation there is a significant decrease in (II). The vagus escape phenomenon is neither due to lack of (II) nor to inhibition of formation of (I) from (II).

Metabolism of Acetylcholine Precursor in Isolated Hearts. Abdon, N. O. [*Ibid.*, 169-83.]

In the isolated rabbit heart (Langendorff preparation) there is a constant breakdown and formation of precursor (II) independent of vagal mechanisms. Part of the liberated acetylcholine (I) is immediately resynthesized to (II) and this reaction is favored by the presence of glucose. Part of the (I) is hydrolyzed to choline by the esterase and lost by diffusion. This loss is remedied by addition of choline to the bath solution, some of the added choline is synthesized to (II). The synthesis requires energy. Anaerobic conditions cause a rapid fall in (II). The (II) metabolism goes on without vagal influences. The liberation of (I) by vagal stimulation means that the resynthesis of (II) is retarded. It is probable that the accumulated (I) secondarily transmits the vagal impulses to other chemical or physical mechanisms in the heart. Atropine has no influence on breakdown or formation of (II). There is a correlation between (II) content and mechanical properties of the heart. Addition of choline to the bath fluid, which enables the heart to maintain its (II) content, has a positive inotropic effect. The (II) is not only the source of the vagal transmitter, but also appears to be necessary for contraction of cardiac muscle.

Liberation of Acetylcholine from the Precursor in Voluntary Muscles without Motor End Plates. Abdon, N. O. [*Ibid.*, 325-35.]

After section of the motor nerves to a voluntary muscle (gastrocnemius) there is a loss of the precursor (II); about a quarter is left after 3 weeks in the rabbit or after 4 weeks in the frog. The decrease in (II) develops considerably slower than the degeneration of motor end plates and is probably more closely connected with the general degeneration of the muscle cell. After complete degeneration of the motor end plates the remaining (II) is readily broken down to free acetylcholine upon direct stimulation. As is known, a part of the normal frog sartorius muscle contains about the same concentration of (II) as the neural region of the muscle. If the muscle is stimulated through the motor nerve until it is completely fatigued, the (II) is broken down in all parts of the muscle and not just in the immediate vicinity of the motor end plates. This suggests that (II) has some other function in addition to that of humoral transmitter from nerve to muscle.

L. E. GILSON (Chem. Abstr.).

Present Views on the Mode of Action of Acetylcholine in the Central Nervous System. Feldberg, W. [*Physiol. Rev.*, **25**, 596-642 (1945).]

All the evidence in favor of acetylcholine as a central transmitter has been obtained by methods previously applied to the peripheral nervous system. There is strong evidence that transmission across a number of synapses in the central pathway of autonomic and motor neurones occurs through the mediation of acetylcholine. However, there is little evidence for such transmission across many other central synapses, and there are facts difficult to reconcile with the theory of acetylcholine as a universal transmitter. The evidence for and against is presented. Acceptance or rejection of the theory depends on the relative value attached to the various findings and the kinds of evidence regarded as decisive. The main danger at present for the theory is not the difficulties opposing it, but the attempt to base it on single facts. If, however, we must assume that acetylcholine is not the universal transmitter, then our concept of its role in the central nervous system will be influenced greatly by views concerning transmission across synapses not affected by acetylcholine. Possibly a completely new approach must be found to settle the question.

M. E. MORSE (Psychol. Abstr.).

Pain of Organic Disease Relieved by Prefrontal Lobotomy. Freeman, W., and Watts, J. W. [*Lancet*, **250**, 953-955 (1946).]

Five cases (recurrent carcinoma, tabes dorsalis, thalamic syndrome, trauma to the cauda equina and hysterical contractures) are reported of prefrontal lobotomy

performed for the relief of pain. "The present cases indicate that when pain due to organic disease becomes unbearable and the fear of pain becomes as dreadful as the pain itself, prefrontal lobotomy is a desirable procedure. Psychosurgery alters the subject's reaction to pain without materially changing his ability to feel pain."

A. C. HOFFMAN (Psychol. Abstr.).

Indophenol Oxidase of the Central Nervous System. I. Photometric Quantitative Determination of Indophenol. Mitolo, Michele (Univ. Bari, Italy). [Bull. soc. ital. biol. sper., **20**, 829-31 (1945).]

A mixture of solutions of α -naphthol, *p*-phenylenediamine, and NaOH was added to pulped nerve tissue and stirred from time to time for one hour at room temperature in diffused light. The indophenol formed was dissolved in 97 per cent. alcohol, shaken, filtered off after 25 minutes and determined photometrically.

HELEN LEE GRUEHL (Chem. Abstr.).

Histochemical Differentiation of Lipoids. III. Critical Evaluation and Control of the Petroleum Ether Method for Sudanophile Histolipoids. Giordano, Alfonso. (Univ. Pavia, Italy). [Boll. soc. ital. biol. sper., **20**, 510-11 (1945).]

To determine whether all or only part of the sudanophile fatty substances resist the solvent action of petroleum ether during fixation, tissue sections were treated with petroleum ether for 5 days. After this period, filter paper dipped in the solvent, evaporated and stained with sudan, showed the presence of a moderate amount of such fats in the solvent. For the first 9 to 10 days in petroleum ether the non-ether-soluble histolipoids maintained their sudanophilia. After the 10th day it diminished. The coloration of the fats with sudan was moderate at the 25th day, weak at the 27th and disappeared around the 34th day.

HELEN LEE GRUEHL (Chem. Abstr.).

Two New Colloid Reactions for the Cerebrospinal Fluid. Palma, Eugenio de. [Rev. asoc. bioquim. argentina, **13**, 109-12 (1946).]

The results of the Wassermann, Takata-Ara, Lange, benzoin and mastic tests in 120 cases of general progressive paralysis, tabes, neurolues, and infectious processes are compared with those of a test with a colloidal solution of 20 per cent. asafetida gum in absolute EtOH and with a filtered, colloidal solution of 10 gm. gum ammoniac in 100 c.c. absolute EtOH.

F. FROMM (Chem. Abstr.).

A Method for the Preparation of the Acetalphosphatide of the Brain and its Aldehyde Component in the Form of Dimethylacetal. Klenk, E., and Schumann, E. [Z. physiol. Chem., **281**, 25-8 (1944).]

Thirty gm. of finely divided glycerol phosphatide (I) is thoroughly dried in a vacuum over H_2SO_4 . (I) was obtained by ether extraction of human brain. It was dissolved in 225 c.c. C_6H_6 and after the addition of 75 c.c. of a concentrated alcohol Na solution (5.4 gm. Na in 100 c.c. 99 per cent. alcohol) the solution was placed in a pressure bottle and heated for one hour in a boiling H_2O bath. After standing overnight at room temperature it is filtered with suction and centrifuged. It is concentrated in a vacuum and a mixture of acetalphosphatide (II) and Na salts of fatty acids are precipitated with acetone. The precipitant is resuspended in CH_3OH and the Na salts go into solution. (II) remains undissolved and is removed by filtering with suction. The yield of (II) is 4.5 gm. Details for the chemical analysis of (II) are given as well as separation and characterization of aldehyde mixture.

R. J. ALLGEIER (Chem. Abstr.).

A Simple Method for the Preparation of Phosphorus-free Cerebrosides and also Concerning the Decomposition Product of the Fatty Acids Formed. XVIII. Report on Cerebrosides. Klenk, E., and Leupold, F. [Z. physiol. Chem., **281**, 208-11 (1944); cf. C.A., **37**, 2762³.]

The preparation of cerebrin and kersin is described. The recrystallized products were analyzed and compared with the theoretical C and H values of the pure substances. The nervone acid fraction was converted to the methyl ester and distilled. The physical characteristics of the various fatty acids obtained are tabulated.

R. J. ALLGEIER (Chem. Abstr.).

Comparative Studies of the Histochemistry of Vitamin C and Gold in the Nervous System of Mammals. Sebruyens, Marcel (Univ. Gent.) [*Natuurw. Tijdschr.*, **26**, 83-90 (1944).]

In the gray matter of the brain the highest amount of Au and vitamin C (I) was found in the pyramid cells, but (I) is mostly localized in the Golgi apparatus, while Au is on the opposite pole of the cell. The neuroglia and endothelial cells of the brain are rich in (I) and Au while the white matter of the brain and cerebellum is poor. In the cerebellum the Purkinje cells are richest in Au and (I), both of them diffusely distributed in the cytoplasm. The spinal cord is richer in Au than in (I). The Au is distributed mainly in the anterior column, while (I) is found equally in the anterior and the posterior column. The ependyma cells of the ventricles of the brain and of the aqueductus mesencephali are free of (I) and have little Au, while the cells of the wall of the spine are rich in (I). The ependymic cells of the spine are free of Au. The plexus choroideus has a great affinity for Au, while only small nuclei of (I) are found there. The cerebrospinal ganglions have a very low content of (I) and Au, the content of the vegetative nerves is appreciably higher. The neuroplasm and the fibrils of the peripheral nerves have neither (I) nor Au. The content of (I) and Au in the epiphysis is low. Conclusion: The content of (I) and Au is an indication of the metabolic activity of the cell. The antagonism of the local distribution of (I) and Au in some cells and its causes are discussed.

F. FROMM (Chem. Abstr.).

Sphingomyelins: Their Action on Blood Cells, Particularly Lymphocytes; Their Share in the Nucleinate-like Action of the Ether-insoluble Fraction of Brain Lipids. Tompkins, Edna H. (Vanderbilt Univ. School of Med., Nashville, Tenn.). [*Bull. Johns Hopkins Hosp.*, **78**, 57-77 (1946).]

Intravenous injections of beef brain protagon (ether-insoluble tissue lipid fraction) affect circulating leucocytes in the same way as nucleotides. Sphingomyelins, extracted from this protagon, used in identical experiments exert characteristically different effects.

A. EDELMANN (Chem. Abstr.).

Pyruvate Oxidation in Pigeon Brain Catalyzed by Fumarate. Long, C. (Queen's Univ., Belfast). [*Biochem. J.*, **40**, 278-83 (1946); cf. *C.A.*, **39**, 5262⁵.]

The O consumption of dialyzed pigeon brain suspensions metabolizing pyruvate is stimulated by fumarate only in the presence of PO_4 ion and adenine nucleotide. The rate of disappearance of pyruvate is always decreased somewhat by this fumarate, but since fumarate is also oxidized to pyruvate this exactly balances the decrease in pyruvate disappearance, it is concluded that fumarate does not affect the rate of pyruvate utilization. Under the conditions of the experiments with fumarate PO_4 ion, and adenine nucleotide the ration between O and pyruvate indicates almost complete oxidation to CO_2 and H_2O . The fumarate apparently acts upon some intermediate product formed during pyruvate oxidation.

S. MORGULIS (Chem. Abstr.).

Findings in the Cerebrospinal Fluid. II. Technique and Systematic Interpretation of the Albumin-globulin Ratio in Cerebrospinal Fluids. Lange, Carl (N. Y. State Dept. Health, Albany). [*J. Lab. Clin. Med.*, **5**, 552-9 (1946); cf. *C.A.*, **40**, 1895³.]

Current methods of determining the albumin-globulin ratio in cerebrospinal fluid are markedly inferior to those for blood. The ratio in cerebrospinal fluid varies widely because of the amount of blood proteins that may be present. In low protein concentration, which prevails in neurosyphilis, misleading results are obtained by using 50 per cent. saturation with $(\text{NH}_4)_2\text{SO}_4$ to precipitate the globulin. With MeOH it is possible to secure consistent results in normal fluids and to determine the ratio in various pathological conditions. Evaluation of the ratio should, however, be based on a systematic interpretation of the results of various laboratory tests. An attempt to correlate an isolated finding directly with clinical conditions is, as a rule, misleading. It should be interpreted as an integral part of a complete syndrome. The application of this basic principle indicates that determination of the albumin-globulin ratio in cerebrospinal fluids provides, chiefly, information regarding the permeability of the meninges, which is more conclusively indicated by other procedures.

LEONARD KAREL (Chem. Abstr.).

Glucolysis in the Brain. Lenti, Camillo (Univ. Torino, Italy). [*Boll. soc. ital. biol. sper.*, **20**, 530-1 (1945).]

Rabbit brain was minced and extracted twice for 20 minutes with Ringer solution. The extracted brain tissue was then incubated in buffered Ringer solution saturated with N_2 and CO_2 , deproteinized with CCl_3COOH , centrifuged, and concentrated. The formation of pyruvic acid from glucose by brain tissue was demonstrated by the Jowett and Quastel method (*cf. C.A.*, **31**, 4376⁹). Glucolysis in the brain was discussed.

HELEN LEE GRUEHL (Chem. Abstr.).

Further Studies on the Biochemistry of Reflex Activity. I. Phosphorylation of Glucides in the Spinal Cord During Reflex Activity. Mitolo, Michele (Univ. Bari, Italy). [*Boll. soc. ital. biol. sper.*, **16**, 721-2 (1941).]

Freshly isolated toad spinal cord contained, in mgm. per cent., inorganic P 3.19, phosphocreatine P 7.6, adenyl pyrophosphate P 19.8, P of difficulty hydrolyzable esters 77.2 and total acid-soluble P 136.5. For spinal cord allowed to stand 4 hours without excitation the corresponding values were 32.5, 0.0, 19.3, 84.8 and 136.5. For spinal cord stimulated at frequent intervals for 4 hours the values were, 35.6, 0.0, 11.3, 61.6 and 108.5.

II. *Behavior of the Organic Phosphorus of the Spinal Cord.* [*Ibid.*, **17**, 114-15 (1942).]

Freshly isolated toad spinal cord contained 62-68 mgm. per cent. of organic P. After 4 hours' repose in presence of air it contained 68-75 mgm. per cent., and after 4 hours of reflex activity provoked by pinching every 5 seconds it contained 72-78 mgm. per cent.

L. E. GILSON (Chem. Abstr.).

Nicotinic Acid of Normal Human Spinal Fluid. Cesaro, Angelo Nunziante (Univ. Siena, Italy). [*Boll. soc. ital. biol. sper.*, **17**, 103-5 (1942).]

Values found were 10-50, average 26 γ , per 100 c.c.

L. E. GILSON (Chem. Abstr.).

The Relation of Basal Metabolic Rate in Students to the Results of Various Tests for Physical Fitness and Mental Staleness. Jung, Frederick T., Cisler, Lillian E., Maynard, Mason S. (Northwest. Univ. Med. School, Chicago). [*Quart. Bull. Northwestern Univ. Med. School*, **19**, 105-10 (1945).]

As indications of physical condition, hematocrit readings and lymphocyte percentage appeared to have many advantages over basal metabolic rate and Flack test (pulse response to increased intrathoracic pressure) score. Among 37 medical students tested in the first quarter of their freshman year, the b.m.r.'s were, on the average rather low: -5.94 per cent. and -6.31 per cent. at two test periods 3-7 days apart (averages obtained after exclusion of one improbable high value from each set).

MARION HORN PESKIN (Chem. Abstr.).

Distribution of Intravenously Injected Fructose and Glucose Between Blood and Brain. Klein, J. Raymond, Hurwitz, Ruth, and Olsen, Norman S. (Univ. of Illinois, Coll. of Med., Chicago). [*J. Biol. Chem.*, **164**, 509-12 (1946).]

The authors studied the distribution of fructose and glucose between arterial blood plasma and brain tissue of anesthetized cats after injection of the sugars. The results support a hypothesis that the rate of transfer of fructose from blood to brain is insufficient to meet the metabolic requirements of brain.

KARL F. URBACH (Chem. Abstr.).

Effect of Strong Doses of Lecithin on Lipoid Metabolism. Capraro, V., and Pasargiklian, M. (Univ. Milano, Italy). [*Boll. soc. ital. biol. sper.*, **20**, 454-7 (1945).]

In dogs, doses of 0.23-1.05 gm. lecithin/kgm. body weight diminished the respiratory quotient and greatly increased lipid consumption.

HELEN LEE GRUEHL (Chem. Abstr.).

Inhibition of Phosphorylation of Glucose in Mouse Brains by Viruses and Its Prevention by Preparations of Diphosphopyridine Nucleotide. Racker, E., and Krinsky, I. (New York Univ. Coll. of Med., New York, N.Y.). [*J. Exptl. Med.*, **84**, 191-203 (1946).]

Glucose utilization in homogenates of brains of mice infected with poliomyelitis virus is inhibited with glucose or fructose-6-phosphate as substrate; no inhibition occurs in the presence of hexose-diphosphate. Purified preparations of the Lansing and the Theiler FA strains of mouse encephalomyelitis virus invariably inhibit glycolysis when added to homogenates of normal mouse brain. A similar but much less consistent inhibition is provoked by adding high concentrations of non-neurotropic viruses (influenza and tobacco mosaic virus) to normal mouse brains. The magnitude of inhibition caused by the purified virus is a function of the virus concentration and depends on temperature and time of incubation of the virus-brain mixture. The inhibition of glycolysis in the brains of mice infected with Theiler FA virus and in normal brain-Theiler FA virus mixtures is prevented by the addition of preparations of diphosphopyridine nucleotide and glucose.

C. J. WEST (Chem. Abstr.).

The Vitamin C Content of Cerebrospinal Fluid in Natural Malaria. Wozonig, Helmut (Military Hosp., Mariahilf, Munich). [*Z. Immunitats.*, **105**, 411-16 (1946).]

In malaria tropica the loss of vitamin C in the urine is five or six times more than normal. The concentration of vitamin C in cerebrospinal fluid reflects the depletion of the body by this excessive loss in urine. During the second and third post-febrile weeks the vitamin C reserves are gradually restored. The vitamin C content of the organism influences erythropoiesis.

J. H. LEWIS (Chem. Abstr.).

Changes in the Cerebrospinal Fluid and Blood in Vernal-estival Encephalitis. I. Changes in the Pressure, Morphological Composition, Proteins, and Colloidal Reactions in the Cerebrospinal Fluid in Acute Stages of the Disease. Mandel'boim, A. B. (Inst. Physiol., Acad. Sci. S.S.S.R., and Kazakh. Med. Inst., Alma-Ata). [*Byull. Eksptl. Biol. Med.*, **20**, No. 7/8, 45-8 (1945); cf. C.A. **39**, 5314⁹.]

In tests of 32 patients with acute and chronic vernal-estival encephalitis, the cerebrospinal fluid was clear, colorless, and with significantly high pressure, which reduced with abatement of clinical symptoms. In 25 per cent. of acute cases there was a fibrous precipitant in sterile cerebrospinal fluid, not correlated with symptom differences. In serous meningitis there was moderate pleocytosis, with 30 per cent. of the cells polynuclear and 70 per cent. large or moderate-sized lymphocytes. In 4 acute cases, 4-5 days after onset of symptoms, 8-10 per cent. of the cells were large, plasmatic cells. In early stages of acute cases the globulin and total proteins of the cerebrospinal fluid were supranormal, but these became normal within two weeks. The gold sol (Lange), paraffin (Kafka), and sublimate-fuchsin (Takata-Ara) reactions showed regular changes in the amounts of colloids and their color reactions, and were highly sensitive indexes of biochemical changes in the organism. In all cases the Wassermann reactions of blood and cerebrospinal fluid were negative, a positive reaction only appearing later in luetic cases. The morphological and colloidal changes noted only in early stages of the disease are believed to originate with inflammation of the brain, which later abates.

II. Changes in Pressure, Morphological Composition, and Colloidal Reactions of Proteins in the Cerebrospinal Fluid in Chronic Stages of the Disease. [*Ibid.*, No. 9, 25-8.]

In chronic stages of vernal-estival encephalitis, in all syndromes except the hyperkinetic, the pressure of the cerebrospinal fluid was normal; in the latter case it was abnormally high. In chronic stages of encephalitis the quantity of ordinary elements in transparent and colorless cerebrospinal fluid was normal, the globulin reaction was always negative, the quantity of protein varied within normal limits, the Wassermann reactions of cerebrospinal fluid and blood were negative, and the colloidal reactions often gave curves of the type of lues cerebri. Changes in the colloidal reactions in the disease relate to continual disturbance of carbohydrate-salt exchange.

K. STARR CHESTER (Chem. Abstr.).

Acute Porphyria I. The Pathology of the Porphyrins and Identification of the Excretion of Uroporphyrin I. Prunty, F. T. G. (*Tt. Thomas's Hosp. Med. School, London*). [*Arch. Internal Med.*, **77**, 623-42 (1946); cf. *C.A.*, **40**, 3178³.]

Two cases of porphyria are described, one being of the Waldenstrom "latent type," and the other a typical case of acute porphyria. Evidence of hepatic impairment was obtained with histologic signs of necrosis. Urinary and fecal excretions of coproporphyrin and of uroporphyrin were followed; also, of urinary porphobilinogen in one case. A type III uroporphyrin was isolated from the urine, which was shown upon further examination to be largely type I porphyrin. Type I uroporphyrin was isolated from the liver and feces and type I coproporphyrin from urine and feces. Moderate amounts of porphyrin were demonstrated in the kidneys by ultraviolet microscopic examination.

J. B. BROWN (Chem. Abstr.).

Gaseous Metabolism of the Brain of the Monkey. Schmidt, Carl F., Kety, Seymour S., and Pennes, Harry H. (*Univ. of Pennsylvania*). [*Am. J. Physiol.*, **143**, 33-52 (1945); cf. *C.A.*, **38**, 5556¹.]

Cerebral O metabolism was measured *in vivo* in lightly anesthetized monkeys by measuring cerebral blood flow directly, while samples of cerebral venous and arterial blood were collected for subsequent analysis. Cerebral O uptake changed in the same direction as cerebral functional activity. The physiological range of cerebral O uptake was from about half to nearly double the resting normal value. Convulsions were followed by a period of depressed O uptake of the same order as that produced by a deeply narcotic dose of pentothal. Of the three possible correlations among (a) arterial-venous O difference, (b) blood flow, and (c) O uptake of the brain, that between (a) and (b) was poorest, that between (a) and (c) somewhat better, but that between (b) and (c) the best. Previous work indicating that cerebral circulation of the monkey is affected more consistently and strongly by changes in pO_2 than in pCO_2 was confirmed.

E. D. WALTER (Chem. Abstr.).

Maintenance of Respiratory Activity in Stored Peripheral Nerve. Wortis, Joseph, and Lapouse, Rema (*N.Y. Univ. Med. Coll., New York, N.Y.*). [*Science*, **104**, 247 (1946).]

The proximal portion of the sciatic nerve of the adult white rat can be preserved aseptically in cotton-stoppered flasks in plain Krebs-Ringer solution at 5°5'. The O uptake of fresh nerve in a glucose medium was 0.104 cu. mm. O/hr./mgm. wet tissue, or approximately one-tenth that of whole minced brain. After preservation for 2 and 30 days the O uptake had dropped to 0.055 and 0.044 cu.mm./hr./mgm. respectively. Actually these values should be higher, since the wet weight of the tissue increases by 20 per cent. after immersion in a protein-free solution of the type used.

BRUNO VASSEL (Chem. Abstr.).

Oxygen Supply and Oxygen Consumption in the Nervous System. Bronk, D. W., Davies, P. W., Brink, F., jun., and Larrabee, M. G. [*Trans. Am. Neurol. Assoc.*, **70**, 141-4 (1944).]

O tension in various regions of the intact nervous system was studied by recording the current through a circuit through a small metallic electrode in contact with the tissue under investigation and a non-polarizable electrode maintained at an appropriate difference of potential with respect to the first electrode (Davies and Brink, *C.A.*, **37**, 1145⁸). When this potential difference was 0.3-0.8v. the current depended on the electrolysis of O at the surface of the small electrode, and the intensity of current was a linear function of the O concentration and a lightly anesthetized cat, the O tension at various points at or below the surface of the cortex was found to be 5-100 mm. Hg; the values increased as the electrode approached arterioles or venules, and varied greatly with changes in respiration and circulation. In peripheral nerve fibers the rate of O consumption increased as Ca in the environment decreased.

MARION HORN PESKIN (Chem. Abstr.).

Nervous System Dysfunction During and Following Oxygen-controlled, High-Altitude Indoctrination. Brown, Gordon A., Cronick, Charles H., Motley, Hurley J., Kokour, Elmer J., and Klingman, Walter O. [Trans. Am. Neurol. Assoc., **70**, 113-17 (1944).]

When the program of high-altitude indoctrination at Maxwell Field was altered to meet 38,000 ft. standards, nervous system reactions occurred that were not observed in the former program of test flights up to 28,000 ft. At 18,000 ft. adequate O₂ by diluter-demand regulator was provided, and above 30,000 ft. 100 per cent. O₂ was used. Despite this, conditions of mild anoxia were present, since at 34,000-38,000 ft. the O₂ saturation decreases approximately 86 per cent. Severe dysfunction of the nervous system occurred not only during the period of great change in atmosphere pressure, but also after exposure to high-altitude conditions and return to ground level despite constant O₂ supply. The symptoms were not relieved by continued O₂ administration, but disappeared spontaneously. Among the reactions seen (occurring in a very small percentage of the 40,000 individuals studied) were: Disturbances in equilibrium, co-ordination, consciousness, and functions of the cortex and large sensory or motor tracts; disturbances suggestive of meningeal irritation, increased intracranial pressure, migraine-like features; disturbances of subcortical mechanisms associated with dyskinesia, hyperkinesia, aphasia; and minor reactions, e.g. scotoma, neuralgia, urticaria, syncope, headache, nausea.

MARION HORN PESKIN (Chem. Abstr.).

A Specific Sympathomimetic Ergone in Adrenergic Nerve Fibers (Sympathin) and Its Relations to Adrenaline and Non-adrenaline. v. Euler, U. S. (Karolinska Inst., Stockholm). [Acta Physiol. Scand., **12**, 73-97 (1946).]

The thoracic and lumbar sympathetic chain and the splenic periarterial nerves are very suitable for the preparation of extracts with sympathomimetic activity and contained 30-100 adrenaline equivalent per gm. (determined by blood pressure in cat). The active substance gives the catechol reactions with FeCl₃, but resembles noradrenaline more than adrenaline, from which it differs by its effect on blood pressure following ergotamine or dihydroergotamine, by its action on the non-pregnant cat uterus, pregnant rabbit uterus or isolated intestine (cat or rabbit), by its pupil-dilating action and, finally, by the fluorescence test. The active substance is found in greater amounts in the grey sympathetic than in the white rami; in low concentration in sympathetic ganglia, vagus and phrenic nerves and in various parts of the brain, but in fairly high concentration in the sensory nerves of the skin. After the degeneration of the post-ganglionic periarterial splenic nerves the content of the active substance in the spleen is greatly decreased. It is concluded that the active substance is identical with noradrenaline, and is the physiological transmitter of adrenergic nerve action in mammals. Extracts from frog hearts contain an active substance with properties of adrenaline. The ergone obtained from adrenergic nerves exerting the action of noradrenaline should be named sympathin, corresponding to Cannon and Rosenblueth's sympathin E (cf. C.A., **27**, 4288), whereas sympathin (I) corresponds to adrenaline.

S. MORGULIS (Chem. Abstr.).

Vital Studies of the Neuroplasm. Smitten, N. A. [Am. Rev. Soviet. Soviet Med., **3**, 414-25 (1946).]

The purpose of the experiments was to study the colloidal physical state and reactive properties of neuroplasm, after injury and excitation of the neurons. The nerve cells responded immediately to injury and stimulation by uniform structural shifts in the protoplasm and nucleus. The protoplasm of the living nerve cells represents a very soluble liquid, which is able under the influence of injurious factors to pass instantly into the state of a highly viscous gel. Along with gelation of the injured cell there occurred a shift of the intracellular reaction toward the acid range (change in the color tint of methylene blue and neutral red). Gelation and the associated acidosis of the neuroplasm indicate the paranecrosis of the nerve cells.

W. R. HENN (Chem. Abstr.).

Endemic Pellagra in Northern Portugal. Monteiro, A. Moura, Coutinho, Herculano, Janz, G. J., and de Loureiro, J. A. (*Faculty Med., Lisbon, Portugal*). [*J. Hyg.*, **44**, 518-25 (1946).]

A clinical and biochemical study of a group of 30 patients from northern Portugal showed them to have a mild form of pellagra, with no sign of severe malnutrition or of associated deficiencies except dental abrasion caries and pyorrhoea. Their diet was chemically satisfactory in most respects. Apart from very low consumption of animal protein, the gross intake on calories, total protein, minerals, and vitamins, including nicotinic acid, was satisfactory. The syndrome was completely cured by nicotinic acid, but it was suggested that the main characteristic of a diet on which pellagra is likely to occur is not a shortage of nicotinic acid, but a lack of high-grade protein. A maize diet, satisfactory so far as calories and total protein are concerned, may produce pellagra, because maize proteins are deficient in certain essential amino acids. Other cereal diets may also produce pellagra if the general level of nutrition is very low. Such a syndrome can be cured either by very large doses of nicotinic acid without change in diet, or by a moderate dose accompanied by abundant animal protein.

JOHN T. MYERS (Chem. Abstr.).

Food Ration and Brain Work. Binet, L., and Duhamel, G. [*Bull. acad. med.*, **124**, 355-67 (1941); *Chimie and Industrie*, **47**, 255 (1942).]

In brain work, questions of quality are more important than quantity equivalence; but it is, nevertheless, work that represents a certain amount of energy which can be supplied only by food and the organic reserves, and the quality itself of the work depends to a notable extent on the quality of the food. In the intellectual worker the consumption of O is definitely increased, and the working of the brain is accompanied by an increase in the inorganic P content of the blood and in the renal excretion of P. Cerebral activity is generally accompanied by muscular contractions which ultimately increase the amount of energy expended. Brain fatigue is often complicated by insomnia and frequently by headaches due to accumulation of waste matter resulting from excessive working of the brain. Insomnia, in turn, tends to increase this fatigue.

A. PAPINEAU-COUTURE (Chem. Abstr.).

The Determination of Cerebral Blood Flow in Man by the Use of Nitrous Oxide in Low Concentrations. Kety, Seymour S., and Schmidt, Carl F. [*Am. J. Physiol.*, **143**, 53-66 (1945); cf. *C.A.*, **40**, 7355⁸.]

A method is described applicable to unanesthetized man for the determination of cerebral blood flow by means of arterial and internal jugular blood concentrations of an inert gas during the first 10 minutes of its inhalation in low concentration. Sixteen determinations of cerebral blood flow on 11 human subjects by this method have been made, and suggest the feasibility of applying it to clinical investigation.

E. D. WALTER (Chem. Abstr.).

Metabolism of Nerve Tissue. V. Creatine and the Phosphocreatine Index: Methods. Ciaccio, C., and Capri, A. (*Univ. Messina, Italy*). [*Boll. soc. ital. biol. sper.*, **17**, 397-8 (1942); cf. *C.A.*, **33**, 1800⁸.]

Known methods of determining creatine and its derivatives are discussed. For obtaining true creatine values the 3,5-dinitrobenzoate method of Langley and Evans (*C.A.*, **30**, 7607⁸) is preferred.

VI. Creatine and the Phosphocreatine Index of the (Toad) Spinal Cord under Various Conditions. [*Ibid.*, 399-401.]

Normally practically all of the creatine is present as phosphocreatine. Small doses of strychnine or stovaine do not change this condition; iodoacetate brings about the liberation of much free creatine.

VII. Phosphorylations in Homogenates Treated with Potassium Chloride. [*Ibid.*, 401-3.]

KCl, NaHCO₃, and glucose or glycogen were added to toad spinal cord homogenates. Some unidentified, readily hydrolyzable hexose and triose phosphoric esters were formed in the presence of KCl, but not in its absence.

L. E. GILSON (Chem. Abstr.).

Resorptive Action of Mustard Gas on the Central Nervous System. II. Changes in Subordinate Chronaxia after Applying Mustard Gas to the Skin. Levitina, G. A., and Palatnik, S. A. [*Farmakol. i Toksikol.*, **8**, No. 1, 42-6 (1945); cf. *C.A.*, **39**, 3074.²]

Mustard gas (I) on the skin of rabbits increases chronaxia of flexor digitorum muscles; chronaxia of extensor digitorum muscles remains constant. The amount and duration of change in chronaxia depend on dosage; after a mild dose of (I) the change gradually relaxes, but not after a lethal dose. Chronaxia of the tibial nerve is also increased. The tests show that (I) lessens the subordination of the peripheral to the central nervous system.

JULIAN F. SMITH (Chem. Abstr.).

Synthetic Antihistamines: New Test of the Part Played by Histamine in Physiology and Pathology. Chauchard, P. [*Rev. sci.*, 466-7 (1943); *Chimie et industrie*, **53**, 405 (1945).]

Histamine injection produces hypotension with vasodilatation, cardiac acceleration, vomiting, diarrhea and asthma, the last three owing to contraction of smooth muscles. Affections which long remained mysterious (urticaria, hay fever, etc.) are now attributed to liberation of histamine in the body. There is now available a compound with a remarkable, specific antihistamine action; it is benzyl (dimethylaminoethyl)-aniline or antergan (No. 2339 R.P.). It protects the guinea-pig against 50-60 lethal doses of histamine, and the therapeutic dose is 175 times smaller than the m.l.d. It abolishes all the effects of histamine, including the cutaneous reaction, and is used successfully in cases of urticaria, hay fever, pruritus, and migraine.

A. PAPINEAU-COUTURE (Chem. Abstr.).

The in vivo Inactivation by Cyanide of Brain Cytochrome Oxidase and Its Effect on Glycolysis and on the High-energy Phosphorous Compounds in Brain. Albaum, Harry G., Tepperman, Jay, and Bodansky, Oscar (Edgewood Arsenal, Md.). [*J. Biol. Chem.*, **164**, 45-51 (1946); cf. *Keilin, C.A.*, **23**, 3719; *Stotz, et al., C.A.*, **32**, 7934⁴.]

Rats injected intraperitoneally with 5 mgm. NaCN per kgm. body-weight showed approximately 250 per cent. decrease in cytochrome oxidase activity in the brain. The brains of these cyanide-poisoned rats showed significant decreases in the concentration of glycogen, phosphocreatine, and adenosine triphosphate, and significant increases in the concentration of inorganic phosphate, lactic acid, hexose diphosphate, phosphoglycerate, and phosphopyruvate. These results indicate that anoxia in tissue induced by inactivation of cytochrome oxidase results in a shift from aerobic to anaerobic metabolism and a depletion of high-energy P compound.

LEONARD KAREL (Chem. Abstr.).

Hyperglucemia from Convulsive Seizures. Tolone, Salvatore (Univ. Napoli, Italy). [*Boll. soc. ital. biol. sper.*, **20**, 295-7 (1945).]

Convulsive attacks were produced in dogs by injections of metrazole or NH_4Cl . Immediately after the attack the arterial blood contained 0.80 gm./l glucose; $\frac{1}{4}$ hour after attack 1.28 gm.; at the 4th hour blood sugar was normal. Venous blood immediately after the attack contained 0.32 gm. glucose; $\frac{1}{4}$ hour after attack 1.07 gm.; 1 hour after, 1.12 gm. The values diminished to normal at the 4th hour. On the basis of the arterio-venous blood-sugar relationship the cause of the hyperglucemia was attributed to a neuro-dynamic character of the drug used to induce the attack.

HELEN LEE GRUEHL (Chem. Abstr.).

A Transitory Decrease in Glucose Tolerance following Experimental Lesions in the Central Nervous System (of Dogs). Keller, Allen D. (Baylor Univ., Waco, Texas). [*Proc. soc. Exptl. Biol. Med.*, **62**, 318-19 (1946).]

L. E. GILSON (Chem. Abstr.).

Neuro-humoral Nature of the Myotonic Syndrome. Minz, B., and Passouant, P. (Univ. Montpellier). [*Compt. rend. soc. biol.*, **139**, 950-2 (1945); cf. *C.A.*, **40**, 2218.²]

Chiefly discussion. In myotonia the cholinesterase of the blood, spinal fluid, and especially the muscles is below normal and the acetylcholine of the muscles is considerably above normal.

L. E. GILSON (Chem. Abstr.).

The Model of Lillie in Connection with the Growth of the Nerve Fiber. Brummelkamp, R. [*Proc. Netherlands Acad. Sci.*, **48**, 360-8 (1945) (in English).]

Lillie's model (a stretched iron wire immersed in a HNO_3 solution) furnishes a clue toward explaining the physiological properties of nerve conduction, and may help in explaining the growth of nerve fiber. The powers which influence the growth of nerve fibers may be considered as powers in an electric field, and Lillie's model and the nerve fiber correspond in having the same spatial pattern. The phenomenon of neurobiotaxis can be correlated with results secured using the model.

J. E. WEBSTER (Chem. Abstr.).

Sympathetico-adrenal Discharges in Hypophysectomized Rats. Safford, H., Wells, L., and Gellhorn, E. (Univ. of Minnesota, Minneapolis). [*Am. J. Physiol.*, **146**, 386-8 (1946).]

The hyperglycemic response to adrenaline secreted under conditions of anoxia, or to its injection, is present for several days after hypophysectomy. This indicates that the hypophysis plays no direct role in sympathetico-adrenal reactions. However, this effect disappears in the course of several weeks following hypophysectomy, although the fasting blood-sugar level is not significantly altered. This failure of adrenaline to cause hyperglycemia is not explainable on the basis of the regressive changes in thyroid and adrenal cortex, nor is it due to alterations in absorption, since it is observed under conditions of anoxia, when adrenaline is secreted into the blood stream as well as after intraperitoneal injection of adrenaline.

E. D. WALTER (Chem. Abstr.).

The Effect of Hypoglycemia and Age on the Glycogen Content of the Various Parts of the Feline Central Nervous System. Ferris, Shirley, and Himwich, Harold E. (Union Univ., Albany, N.Y.). [*Am. J. Physiol.*, **146**, 389-93 (1946).]

The concentrations of glycogen in various parts of the central nervous system of newborn and 6.5-week-old kittens subjected to intense hypoglycemia were determined. In the newborn animal the more caudal parts showed the greater fall in concentration. The spinal cord was depleted most, followed in order by the cerebellum, medulla, thalamus, and corpora quadrigemina, while the cerebral cortex showed the smallest decrease. In the 5-8-week-old kittens the higher parts exhibited a greater decrease. The glycogen in the cerebral cortex was depleted to the greatest extent, followed by the corpora quadrigemina and thalamus, while the concentrations in the cerebellum, medulla oblongata and cord were not changed significantly during hypoglycemia. The higher areas suffered smaller impairments than in the adult, while the phylogenetically older regions were not depleted, and in this way differ from the newborn.

E. D. WALTER (Chem. Abstr.).

Localization of the Two Phosphatases in the Central Nervous System. Carandante, Giovanna (Univ. Naples). [*Boll. soc. ital. biol. sper.*, **16**, 443-4 (1941).]

L. E. GILSON (Chem. Abstr.).

Water Intoxication and the Electroencephalogram. Gellhorn, Ernst, and Ballin, H. M. (Univ. of Minnesota, Minneapolis). [*Am. J. Physiol.*, **146**, 559-66 (1946).]

A study of the changes in brain function by means of the electroencephalogram during progressing water intoxication.

E. D. WALTER (Chem. Abstr.).

Pellagra: A Study in Human Nutrition. The Multiple-factor Principle of the Determination of Minimum Vitamin Requirements. Frazier, Ernestine I., and Friedemann, Theodore E. (Northwestern Univ. Med. School, Chicago). [*Quart. Bull. Northwestern Univ. Med. School*, **20**, 24-48 (1946).]

Dietary records obtained by Goldberger and others on 1,863 human subjects have been recalculated for protein, thiamine, riboflavin and nicotinic acid contents. It is concluded that the minimum daily intake of nicotinic acid needed in a marginal diet containing corn products is about 7.5 mgm. This can be decreased to about 5 mgm. by a high level of good quality protein, riboflavin, or other dietary factors in green vegetables. If any of the latter three classes of ingredients are low, the nicotinic acid requirement is increased. On a corn-containing diet supple-

mented by large amounts of milk, or on a diet without corn, the minimum nicotinic acid requirement is about 4 mgm./day. A liberal diet with generous amounts of green vegetables and good proteins (meat, milk, eggs) is the best safeguard against pellagra. MARION HORN PESKIN (Chem. Abstr.).

Causes of Experimental Gastroprival Pellagra. III. Therapeutic Experiments on Dogs with Preventative Parenteral Administration of Vitamin B₆ Alone or Together with Vitamin B₁, Lactoflavin, and Nicotinic Acid. Petri, Svend, Norgaard, Flemming, Trautner, Kjeld, and Kiaer, William (Kommunehosp., Patholog. Inat., Copenhagen). [*Acta Med. Scand.*, **117**, 90 (1944); *Chem. Zentr.*, **11**, 233 (1944); cf. *C.A.*, **40**, 116⁵.]

Studies were made on dogs from which the stomach and the beginning of the duodenum (Brunner glands) had been extirpated. In addition to an otherwise normal diet, the first group (two animals) received the following total amounts of vitamins per animal over a period of 202 days: Vitamin B₁ 251, lactoflavin 90.9, nicotinic acid 720 and vitamin B₆ per animal over a period of 384 days. Clinically all the animals appeared to be ill, but none died. The animals showed a retardation of growth, emaciation, certain changes in the blood picture, and other phenomena; in only one animal were slight degenerative changes in the central nervous system observed. The symptoms of pellagra previously observed in such experimental animals (neuro-cutaneous symptom complex) were decidedly influenced by parenteral treatment with vitamin B₆, as the clinical findings indicated. In particular, the treatment prevented changes in the central nervous system and a decrease in the number of red blood corpuscles, and partially prevented changes in the pelts of the animals. The simultaneous administration of the other vitamins appeared at most to have only a supplementary effect on some of the symptoms. Vitamin B₆, therefore, appears to be the only one of the vitamins so far tested which has a definite therapeutic effect on experimental gastroprival pellagra. From these and earlier results it must be assumed that the fundus plays an important role in the behavior of vitamin B₆ in the organism. M. G. MOORE (Chem. Abstr.).

Further Tests on a Fit-producing Dog Food. Morgan, Agnes F., and Groody, Mary. [*J. Am. Vet. Med. Assoc.*, **108**, 179-83 (1946).]

A baked cereal dog food previously found to cause severe running fits in dogs within 5 to 19 days was found by rat growth to be deficient in protein, since its growth value was improved by the addition of 5 casein, 20 wheat gluten, or 20 per cent. baked wheat gluten, but not by the addition of 1 per cent. yeast extract of high vitamin content. RACHEL BROWN (Chem. Abstr.).

The Pseudo-cholinesterase of Serum and the True Cholinesterase of the Red Corpuscles. Casier, H., and Delaunois, A. L. (Univ. Gand, Belgium). [*Experientia*, **2**, 180-2 (1946) (in French).]

The sensitive method previously described (*C.A.*, **40**, 4759⁸) showed that the pseudo-cholinesterase activity of dog serum gave higher values with a solution of acetylcholine (I) of 250 mgm. per cent. than with one of 4 mgm. per cent. Similarly tested, the true cholinesterase activity of a solution of hemolyzed cells equivalent to 0.2 c.c. of washed corpuscles was highest for the first 3-5 minutes with a 200 mgm. per cent. solution of I, after which the rate decreased to a slower but constant rate. With a 100 mgm. per cent. solution of (I) the initial period of greater activity lasted about 2 minutes, with the 4 mgm. per cent. solution about 10 minutes. The difference in rate was attributed to the choline liberated. No such rate change was noted with a 50 mgm. per cent. solution. The cholinesterase activities of both serum and corpuscles were inhibited *in vivo* and *in vitro* by prostigmine. C. P. BERG (Chem. Abstr.).

Determination of Nicotinic Acid and Nicotinamide in Cerebrospinal Fluid. Cazzullo, C. L. (Univ. Milano, Italy). [*Boll. soc. ital. biol. sper.*, **16**, 755-7 (1941).]

Methods are discussed. For human spinal fluid the average is 16-20 γ per cent. of total nicotinic acid, of which most is in the form of the amide.

L. E. GILSON (Chem. Abstr.).

Further Studies on the Biochemistry of Reflex Action. Part III. Creatine in the Central Nervous System and Reflex Action. Mitolo, M. [*Fisiol. e Med.*, 9, (1943).]

In *Bufo vulgaris* the creatine content of the axon is compared in the living and dead animal under conditions of apparent quiet and reflex activity. The possibility of a correlation between the glycolytic process and reflex behavior is considered.

M. STUPARICH (Psychol. Abstr.).

Electrical Processes in the Rabbit's Cortex During the Development of a Conditioned Defense Reflex in Response to a Rhythmic Stimulation. Livanov, M. N., and Poliakov, K. L. [*Bull. Acad. Sci. U.R.S.S., Ser. Biol.*, No. 3, 286-307 (1945).]

A conditioned defense reaction was established in the rabbit, using as CS a rhythmic stimulus with a frequency of 3 stimulations per second, and, as US, shock to the hind leg presented in a corresponding rhythmic pattern. Simultaneous EEG records were taken. Long before the CR developed, oscillations appeared in the EEG record, having either the frequency characteristics of the stimulus or else a frequency of one half the stimulus frequency. Sample records showing this phenomenon are reproduced. It was noted that these oscillations appeared spontaneously outside the conditioning situation, and in response to the presentation of stimuli like CS. The appearance of the CR on about trial 50 was accompanied by the increase in EEG oscillations, however elicited. But by about trial 70, when the CR was firmly established, the 3 per second activity appeared only in response to CS. Whenever EEG activity of one half the stimulus frequency appeared, pneumograms revealed that the breathing rate approximated that of the EEG. Subsequently it was shown that sound, pain, and other stimuli which elicited the defense reflex also produced the brain wave pattern, as did spontaneous movements which duplicated the CR. Finally it was shown that these rhythms disappeared with the development of differentiation, somnolent states, and in extinction. On the basis of these results the authors suggest that conditioning the defense reaction to a flickering stimulus is dependent on the production in the cortex of periodic changes in the excitability of the motor areas.

G. A. KIMBLE (Psychol. Abstr.).

Nerve as a Model Temperature End Organ. Bernhard, C. G., and Granit, R. [*J. gen. Physiol.*, 29, 257-65 (1946).]

Rapid cooling of mammalian nerve initiates a discharge which is preceded by a local temperature potential, the cooled region being electronegative to a normal portion of the nerve. Similarly, heating the nerve locally renders the heated region electronegative with respect to a region of normal temperature, and a discharge may be initiated from the heated region. The mechanism underlying these "generator potentials" is regarded as the prototype for temperature end organs.

P. KELLAWAY (Psychol. Abstr.).

An Attempt to Analyze the Mechanism of Sleep in Hibernation. Kayser, C. [*Ann. Physiol. Physicochim. biol.*, 16, 313-72 (1940).]

The external factor responsible for hibernation is reported to be a lowering of the temperature of the environment to between 5° and 13° C. The internal factor appears to be a polyglandular deficit resulting from an involution of the hypophysis. The first behavioral signs of hibernation, food hoarding, and nest building appear when the anterior hypophysis begins involution. Hypophysectomized hamsters placed in an environment of 8° C. showed the behavioral manifestations, but sleep did not follow. The glandular changes, together with sympathetic dysfunction, appear to produce sleep through a disturbance of the thermo-regulatory function.

(Psychol. Abstr.).

2. Pharmacology and Treatment.

Ether Concentration in Blood and Brain in the Early Stages of Ether Narcosis. Dybing, Fred, and Dybing, Ottar (Veterinary Coll., Copenhagen). [*Acta Pharmacol. Toxicol. (Copenhagen)*, 1, 270-9 (1945) (In English).]

During ether narcosis in rabbits, with Et₂O-O₂ mixtures with high concentrations of ether, the ether content of the blood was 0.143-0.158 per cent. and of the brain 0.167-0.187 per cent. at the moment of respiratory and cardiac paralysis

during short periods of narcosis (10-15 minutes). These levels were not significantly raised by prolonging the period to 45 minutes. In experiments on rats with inhalation of ether in known concentrations, a picture of the ether diffusion in the early stages of narcosis was obtained by parallel determinations of ether in blood, brain and muscle after ether administration for 0.5-25.0 minutes. The results are shown as graphs. After 5 minutes the maximum concentrations were, blood 0.077, brain 0.108, and leg muscle 0.046 per cent.; after 25 minutes the maximum values were 0.13, 0.14 and 0.09 per cent. respectively.

L. E. GILSON (Chem. Abstr.).

Respiration of Peripheral Nerves in the Presence of Sulfonamides in vitro. Maleci, O. (Univ. Padova, Italy). [Boll. soc. ital. biol. sper., **17**, 716-17 (1942).]

The respiration of guinea-pig nerve was decreased by a 0.3 per cent. solution of sulfanilamide or a 0.6 per cent. solution of sulfathiazole, but not by solutions of half these concentrations. It is doubtful if the concentrations attained *in vivo* by sulfonamide therapy have any effect on the nervous system.

L. E. GILSON (Chem. Abstr.).

Fixation of Salts of Procaine Base by Brain Powder and by Nerve Tissue in vitro. Regnier, Jean, Bazin, Suzanne, and Fere, Jacqueline (Univ. Paris). [Compt. rend. soc. biol., **139**, 939-40 (1945); cf. C.A., **40**, 4434.²]

Dried brain and fresh nerve tissue were soaked in diluted solutions of procaine phenylpropionate, isobutyrate, acid citrate and hydrochloride and the amounts fixed by the tissues determined.

L. E. GILSON (Chem. Abstr.).

The Relief of Tic Douloureux with Large Doses of Ferrous Carbonate. Davidoff, Leo M. [Trans. Am. Neurol. Assoc., **70**, 176 (1944).]

In confirmation of an observation made by Benjamin Hutchinson in 1822, Davidoff has found that 4 gm. FeCO_3 twice daily relieves at least 50 per cent. of the pain of paroxysmal trigeminal neuralgia.

MARION HORN PESKIN (Chem. Abstr.).

The Vulnerability to Drugs of Various Cortical Regions as Evidenced by the Electroencephalogram. Finesinger, Jacob E., and Brazier, Mary A. B. [Trans. Am. Neurol. Assoc., **70**, 151-4 (1944).]

Na amyltal, tried in 17 subjects, and Na pentothal, tried in 20, consistently caused high-voltage fast-activity (waves of 23-28 cycles/second and voltages above 50 μv .) in the electroencephalogram, after intravenous administration. The effects of the drugs appeared first in recordings from the frontal lobes, then in those from the parietal regions, finally in those from the occipitals. Regression was in the opposite direction. The presence of excess O_2 in the inspired air decreased the effect of the barbiturates; intravenous injection of Na succinate, which acts as an extra substrate carrying more O_2 to the cells for metabolism, had the same effect as inspired O_2 .

MARION HORN PESKIN (Chem. Abstr.).

A Cycle of Morphine Addiction; Biological and Psychological Studies. Part II. Psychological Investigations. Brown, R. R. [Publ. Hlth. Rep., Wash., **61**, 37-53 (1946).]

Psychological and psycho-physiological studies were made on two post-addicts before, during and following the developments of tolerance to and dependence on morphine. Both patients were studied every other week over a 2-year period. The following measurements were taken: Johnson code learning, sensitivity to electric current, steadiness, tapping speed, continuous subtraction, Scripture's block oscillations, immediate and delayed recall of nonsense syllables, voice- and hand-response time and physiological reactions (blood pressure, pulse rate, skin conductance, and respiration) to word stimuli. It was found that addiction to morphine was associated with reduction in efficiency, with the possible exception of steadiness in the case of one subject. The amplitude of the electrodermal response to word stimuli was significantly reduced following the administration of morphine, whereas the blood-pressure response to the same stimuli was increased. Statistically significant differences between indifferent and disturbing words were found for both patients with respect to electrodermal response, respiratory changes and

voice-response time. Morphine decreased the response difference between these two types of word stimuli. The suggestion was made that morphine may act to ameliorate the disturbing effects of emotional stress.

C. P. FROELICH (Psychol. Abstr.).

Resorptive Action of Mustard Gas on the Central Nervous System. III. Mechanism of the Action of Mustard Gas on Cerebral Cortex after Application to the Skin. Levitina, G. A., and Palatnik, S. A. [*Farmakol. i Toksikol.*, **8**, No. 6, 32-5 (1945); cf. *C.A.*, **40**, 6172⁶.]

Application of mustard gas (I) to devascularized, denervated rabbit ears, and of mustard oil (II) and croton oil (III) to dorsal and aural rabbit skin, showed that (I) on the skin acts on cerebral cortex through the vascular system, not by stimulating peripheral dermal nerve ends. Effects were measured by determining cerebral cortex chronaxia. The reaction was not the same with (I) as with (II) and (III); it is known that (II) acts by stimulating peripheral nerve ends.

JULIAN F. SMITH (Chem. Abstr.).

Influence of Soviet Synthetic Antimalarials (Acridine and Plasmocide) on the Nervous System. Shteinberg, A. D. [*Farmakol. i Toksikol.*, **8**, No. 4, 6-9 (1945).]

A single wetting with plasmocide (I) solution at 5 p.p.m. noticeably decreases the condition of frog sciatic nerve. For a like effect with acridine (II) the concentration must be about 1,000 p.p.m. Whereas (I) prolongs the latent reflex period in canine spinal cord, (II) has only a slight effect. While (I) kills by respiratory paralysis, (II) kills by cardiac paralysis. Again, (I) has a slow but pronounced febrifuge action, (II) has scarcely any. To protect the central nervous system (II) may be given along with a bromide, e.g. 2 per cent. aqueous NaBr.

JULIAN F. SMITH (Chem. Abstr.).

Influence of Chinese Schisandra Fruits on Spinal Centers. Pozdyankov, F. E. [*Farmakol. i Toksikol.*, **8**, No. 4, 15-19 (1945).]

Finely powdered schisandra fruits, dose 0.5-2 gm./kgm. per os or by direct introduction into the stomach, stimulate the spinal reflexes of posterior extremities in dogs after low total chordotomy. Motor activity and general behavior are not significantly changed. Probably similar neurodynamic changes in anterior parts of the body require a different technique, e.g. conditioned reflexes, chronaxia, ergographic tests, or the like. A larger dose (3 gm./kgm.) causes hyperkinesis, emotional stimulation, heightened posterior spinal reflexes and retarded urination and defecation in 1-2 hours. Smaller doses take 4-6 hours; symptoms last 4-20 hours. Schisandra fruits appear to be suitable for use in stimulants for the central nervous system.

JULIAN F. SMITH (Chem. Abstr.).

Toxicological Studies on Mescaline. Tarsitano, F. (Univ. Napoli, Italy). [*Boll. soc. ital. biol. sper.*, **20**, 762-3 (1945).]

Tests were carried out on the viscera of dogs previously injected subcutaneously with mescaline sulfate. The most sensitive qualitative method for the identification of mescaline in the viscera was found to be the Bouchardat method. The Mayer reaction was almost as sensitive, followed in order of diminishing sensitivity by the Dragendorff, picric acid and HgCl₂ tests. In the viscera the greatest portion of the mescaline was found in the liver and kidney, much less in the brain, and no appreciable amount in the blood and lungs.

HELEN LEE GRUEHL (Chem. Abstr.).

Vitamin B₁ Content of the Blood During Insulin Shock. Bom, Fr., and Petersen, W. Gottlieb. [*Nord. Med.*, **25**, 393-5 (1945).]

By means of a biological method (Lehmann and Nielsen's modification of Schoppfer's phycomycetes test) the thiamine content of the blood was determined in 34 patients who had been given insulin shock therapy. The determinations were made partly while the patients were fasting, partly during the shock. The average fasting blood thiamine value was found to be $8.85 \pm 0.30 \gamma$ per cent., which agrees with Lehmann and Nielsen's normal value of 9.0γ per cent. During the shock all the patients showed an average increase in the thiamine value of $1.48 \pm 0.19 \gamma$ per cent., and a positive correlation was demonstrated between this increase and

the rise in the white blood count, which amounted to $+0.5 \pm 0.2$ ($t = 2.4$). This increase in the amine content is accordingly assumed to be largely due to the leucocytosis during shock. The present studies have thus been unable to confirm the hypothesis advanced by various authors that an absolute, perhaps temporary, vitamin B₁ deficit occurs during the insulin shock. The complications encountered in these patients (spasms, clonic convulsions, and difficult in awakening) were very slight. Only in two cases of such complications, however, was there a suggestion of subnormal thiamine values (6.1 and 6.7 γ per cent. respectively), nor were the average fasting values lower in patients with such complications. No connection between the frequency of such complications and possible low fasting thiamine values could thus be demonstrated. The patients with such complications seem, on the other hand, to present a somewhat smaller increase in thiamine and white blood counts than do patients without complications. This suggests that the tendency to complications, among other things, possibly may be due to a failure in the mobilization of thiamine and in the leucocytosis, but the smallness of the present material allows no definite conclusions in this direction.

H. KRINGSTAD (Chem. Abstr.).

The Relationship Between Cholinesterase Inhibition and the Pharmacological Action of Diisopropyl Fluorophosphate (DFP). Koelle, George B., Gilman, Alfred, and Binzer, Bertha D. (Edgewood Arsenal, Md.). [*J. Pharmacol.*, **87**, 421-34 (1946).]

Rats, dogs, and monkeys appeared to show no physiological abnormality when the cholinesterase of the blood and tissues was reduced to a small fraction of its normal activity by DFP. The signs associated with further reduction are described. Determinations of serum and red cell cholinesterase inhibition following administration of DFP do not provide accurate estimates of the activity of the enzyme in the tissues, except perhaps during the period immediately following a single dose. No deterioration was detected in solutions of DFP in peanut oil after autoclaving for one hour or storage at room temperature for one year. The ratio of effective intramuscular to oral dosage for DFP in peanut oil was found to be approximately 1 : 4 in monkeys and human subjects. L. E. GILSON (Chem. Abstr.).

Influence of Dimethylaminoethyl Benzhydryl Ether Hydrochloride (Benadryl) upon Normal Persons and Upon those Suffering from Disturbances of the Autonomic Nervous System. McGarvack, Thomas Hodge, Elias, Herbert, and Boyd, Linn J. (N.Y. Med. Coll., New York, N.Y.). [*J. Lab. Clin. Med.*, **31**, 560-74 (1946); cf. Curtis and Oivens, *Univ. Hosp. Bull., Ann Arbor*, **11**, 25 (1945); Loew et al., *C.A.*, **39**, 2571², 2812².]

The effects of dimethylaminoethyl benzhydryl ether HCl (I) were studied in normal persons and in those with widely diverse diseases, most of which were associated with some disturbance of the autonomic nervous system. Basal metabolism, circulation time, renal function, erythrocyte and leucocyte counts, hemoglobin, differential white counts, hematocrits, blood urea N, creatinine, glucose, proteins, cholesterol, alkaline phosphatase, icteric index, van den Berg reaction, and cephalin flocculation were not abnormally altered. Orthostatic hypotension was observed in some subjects and a slight elevation in pulse rate in others, although the majority showed no circulatory changes. Pupillary dilatation occurred when (I) was instilled into the conjunctival cavity. Vital capacity and respiratory rate were uninfluenced except in asthma. Capillary permeability was moderately decreased after prolonged treatment with large doses. In some subjects, mild transient reactions resulted from the intravenous injection of (I). Salivary secretion was not influenced, but both free and total gastric acidity were strikingly decreased. The mouth-anus time was not altered in normal subjects. Abdominal pain was relieved in 10 of 17 patients. The degree of reduction in the size of the histamine skin reactions was roughly proportional to the daily dose of drug administered. For a brief period after the drug was discontinued the response to histamine was increased. Definite therapeutic effect was obtained from the drug in certain gastro-intestinal neuroses, asthma, functional dysmenorrhea, and dermal allergy. Untoward reactions to (I) were of mild degree and of infrequent occurrence. They included dizziness, blurring of vision, weakness and somnolence. Each disappeared promptly upon discontinuing the drug or decreasing the dose.

L. KAREL (Chem. Abstr.).

General Systemic Actions of Diisopropyl Fluorophosphate (DFP) in Cats. Modell, Walter, Krop, Stephen, Hitchcock, Philip, and Riker, Walter, F., jun. (Cornell Univ. Med. Coll.). [*J. Pharmacol.*, **87**, 400-13 (1946).]

In cats DFP produces the following general effects: motor unrest, muscular twitching, tremors, ataxia, weakness, pilomotor stimulation, respiratory stimulation, salivation, defecation, diarrhea, convulsions, respiratory depression, and death. Thus the symptoms are both muscarinic and nicotinic. Death appears to result from a combination of respiratory and circulatory failure. In normal non-protected cats the duration of symptoms is usually brief, recovery or death occurring in a few hours. Cats which have received very large doses of DFP and have been protected by other agents against their acute lethal effects frequently develop a permanent injury with nicotine-like symptoms. The duration of action is only partly due to the persistence of the drug; cats which have received doses and are free of symptoms are sensitized to subsequent doses. Specimens of DFP vary in potency and lose potency fairly rapidly in aqueous solutions. The LD 50 of two specimens were 3.6 mgm./kgm. and 1.7 mgm./kgm. respectively. DFP increases the tone and the rate and amplitude of contractions of the gut—effects which are abolished by atropine and adrenaline. In large doses it sometimes slows the heart. It exerts no immediate direct action on blood pressure. Adrenaline produces its typical effects on heart and blood pressure after DFP. DFP markedly sensitizes the vasodepressor response to acetylcholine. It has no effect on red and white corpuscle count, hemoglobin, blood non-protein N, and blood creatine. It causes prolonged miosis after conjunctival application, and sensitivity to mitotic stimuli after intravenous injection. Inactivation of cholinesterase is the major action of DFP, but there are other secondary actions which play a part in its toxic effects.

L. E. GILSON (Chem. Abstr.).

The Effect of Ethanol, Methanol, Paraldehyde and Acetone on the Pressure of the Cerebrospinal Fluid of the Dog. Bedford, T. H. B. (Manchester Univ.). [*Brit. J. Pharmacol. Chemotherapy*, **1**, 62-4 (1946).]

These compounds have no direct effect on the cerebrospinal fluid pressure of the anesthetized dog, when given by inhalation or intravenously.

WM. M. GOVIER (Chem. Abstr.).

Action of Veratrine Sulfate and of Sodium Thiocyanate on the Superior Cervical Sympathetic Ganglion of the Cat. Caldeyro, R., and Bacq, Z. M. (Facultad med. Montevideo). [*Arch. soc. biol. Montevideo*, **12**, 253-60 (1945) (Pub. 1946).]

Veratrine sulfate (I) applied directly on the superior cervical ganglion of the cat has an inhibitory effect on the transmission of the nerve impulse. This action is reversible, and proportional to the concentration of (I). NaCNS has no effect under the same conditions, but after a series of quick stimuli (300 per minute) (I) and NaCNS block the ganglion partially for 3-4 minutes. This blocking is also reversible.

F. FROMM (Chem. Abstr.).

Stimulation of the Central Nervous System by Curare (Intocostrin). Cohnberg, Rosellen E. (Washington Univ., St. Louis, Mo.). [*J. Lab. Clin. Med.*, **31**, 866-77 (1946).]

Intocostrin injected subcutaneously, intramuscularly, intraperitoneally, or intravenously into rats, mice, guinea-pigs, rabbits or cats produced clonic convulsions and hyperexcitability in addition to partial curarization. Species in which the stimulatory action predominated (namely, rats, guinea-pigs, and mice) were killed by smaller doses than those in which curarization was the chief effect. Since d-tubocurarine was the active principle of intocostrin, experiments were also made with it. Injection of either drug into the lymph sacs of frogs produced muscular relaxation, but injection into the cerebrospinal canal produced convulsions. In all animals death was due to asphyxia, which in turn was due to a combination of a blocking of the neuromuscular junctions of the respiratory systems with a central stimulation. Sodium amytal and cyclopropane decreased convulsions caused by sodium amytal or d-tubocurarine. Sodium amytal, however, in combination with intocostrin was toxic to rats. Oxygen administration or artificial respiration decreased asphyxia, but did not control convulsions.

N. M. PAYNE (Chem. Abstr.).

Mechanism of Action of Convulsant Drugs. Robuschi, Luigi (Univ. Bologna, Italy). [Boll. soc. ital. biol. sper., 16, 557-8 (1941).]

L. E. GILSON (Chem. Abstr.).

A New Method for Determining the Relative Potency of Hypnotic Drugs. Simon, L. (Univ. Pisa, Italy). [Boll. soc. ital. biol. sper., 16, 561-2 (1941).]

The method consists of determining the maximum dose of the hypnotic (administered by any appropriate route) that will not save the life of a rabbit given one minimum lethal dose of strychnine nitrate (0.6 mgm./kgm.) subcutaneously.

L. E. GILSON (Chem. Abstr.).

Influence of Some Analeptics on the Sechenov Inhibition. Zakusov, V. V. [Farmakol. i Toksikol., 8, No. 5, 3-6 (1945).]

Pentamethylenetetrazole (corazole (I), coramine (II), PhC(NH₂)Me₂ sulfate (phenamine (III)), and strychnine (IV) may weaken, but do not halt, the Sechenov inhibition of cerebral stimuli in the central nervous system by crystallized NaCl. Neither does crystallized NaCl halt convulsions caused by (I), (II), (III) or (IV). Inactivity of (I), (II), (III) and (IV) toward the Sechenov inhibition is attributed to excessive stimulation of the thalamic centers of pain sensitivity. The tests were made with frogs, using 50-100 per cent. of the convulsion-inducing dose of (I), (II) or (IV). The dose of (III) which does not cause convulsions in frogs was 4 per cent. of the lethal dose.

JULIAN F. SMITH (Chem. Abstr.).

Tetrazole Derivatives. I. Some Pharmacological Properties of Aliphatic Substituted Pentamethylenetetrazole (Metrazole) Derivatives. Gross, E. G., and Featherstone, R. M. (State Univ. of Iowa, Ames). [J. Pharmacol., 87, 291-8 (1946).]

The effects of the 25 compounds in experimental animals are described. Most of them exhibited pharmacological effects similar to those of the parent compound (metrazole) and none appeared to possess any advantages over metrazole.

II. Some Pharmacological Properties of 1,5-disubstituted Tetrazoles. [Ibid., 299-305.]

Only TT 020, 21, 27, 79 and 18 had an analeptic action or produced convulsions. Some of the others were slightly sedative. The optimum structural factors for maximum stimulatory action appear to be the presence of a relatively large saturated cyclic or open chain aliphatic group in position 1 and a small group, preferably methyl, in position 5.

L. E. GILSON (Chem. Abstr.).

Action of Metrazole, Associated with Eserine, Acetylcholine, and Adrenaline, on the Isolated Frog Heart. Cera, Brizio (Univ. Genova, Italy). [Boll. soc. ital. biol. sper., 17, 227-8 (1942).]

On the isolated frog heart metrazole in 0.1-1 per cent. concentration exerts a negative chronotropic action which is augmented by eserine or acetylcholine. Metrazole antagonizes the paralyzing action of pilocarpine and ergotamine. In the presence of very low concentrations of adrenaline metrazole still exerts its negative chronotropic action and also shows some positive inotropic action.

L. E. GILSON (Chem. Abstr.).

Action of Metrazole on Leech Dorsal Muscle. Cera, Brizio (Univ. Genova, Italy). [Boll. soc. ital. biol. sper., 17, 17-19 (1942).]

Metrazole alone has no action on untreated leech muscle, but in concentrations of 1:1000-1:10,000 it provokes contraction of eserinized muscle. It acts synergistically with acetylcholine. In rabbits pretreatment with eserine salicylate (0.03 mgm./kgm. given intravenously) markedly increases the convulsant action of metrazole, so that convulsions are produced by doses ordinarily too small to do so.

L. E. GILSON (Chem. Abstr.).

Ergotamine and Convulsive Attacks. Robuschi, Luigi (Univ. Bologna, Italy). [Boll. soc. ital. biol. sper., 17, 175-7 (1942); cf. C.A., 40, 3181³.]

In rabbits the injection of ergotamine tartrate diminishes or prevents the convulsant action of metrazole, esetone (Bayer), or NH₄Cl injected a few minutes later.

Vasomotor Activity and Convulsive Attacks. [*Ibid.*, 177-80.]

In rabbits acetylcholine with or without eserine does not inhibit the production of convulsions by metrazole. The injection of amyl nitrite prevents convulsions by metrazole injected 5 minutes later, but not 10 minutes later. The protective action is ascribed to vasodilation produced by the amyl nitrite. Acetylcholine, although it produces vasodilation, fails because of its other actions on the heart, respiration, etc.

Cholinesterase and Convulsive Attacks. [*Ibid.*, 180-2.]

Either metrazole or ergotamine or both together partially inhibit the action of the cholinesterase of guinea-pig brain *in vitro*. The relation of this action to their antagonistic action in respect to production of convulsions by metrazole is not clear.

L. E. GILSON (Chem. Abstr.).

Barbituric Narcosis by Injection into the Bone Marrow. Pagliai, E., and Donatelli, L. (Univ. Firenze, Italy). [*Boll. soc. ital. biol. sper.*, **20**, 691-2 (1945).]

Injections of barbiturates into the bone marrow of guinea-pigs and rabbits showed this route to be as effective in producing narcosis as the intravenous route.

HELEN LEE GRUEHL (Chem. Abstr.).

Influence of External Temperature on the Effect of Hypnotics. Sivadjan, Joseph. [*Compt. rend.*, **223**, 339-40 (1946).]

The increased metabolism incident to exposure to cold results in an increased resistance of rats to the action of barbiturates and consequently increases the narcotic dose.

RACHEL BROWN (Chem. Abstr.).

*Comparative Effects of Analeptics on some Functions of the Central Nervous System.**I. Antagonism of Analeptics to Narcotics.* Ya, S. [Arbuzov. *Farmakol. i Toksikol.*, **7**, No. 6, 31-6 (1944).]

Tests were made with metrazole (I), coramine (II), hexetone (III) and strychnine (IV) as to activity and as to antagonism to urethan (V) and medinal (VI) in male rabbits. The highest antisoporific action was shown by (I) against (V) (1 : 4); against (VI) it was only 1 : 1. Though much weaker in antisoporific effect, (II), (III) and (IV) had a paralytic action, especially when given with (VI). In large doses (I) also had a slight paralytic action when given with narcotics. As an emergency antidote for narcotic poisoning (I) is more effective than (II), (III) or (IV). For biological assays of analeptics against narcotics the method of latent reflex periods (flexor muscles) may be employed. The Zakusov technique (*C.A.*, **34**, 5541²; **36**, 2929⁵) was used in these experiments.

JULIAN F. SMITH (Chem. Abstr.).

Barbiturate Antagonism of Isonipecaine Potentiation of Barbiturate Depression. Way, E. Leong (George Washington Univ., Washington, D.C.). [*J. Pharmacol.*, **87**, 265-72 (1946).]

Barbital, phenobarbital, amytal, pentobarbital, and evipal, in $\frac{1}{8}$ - $\frac{1}{4}$ LD 50 of the Na salt, aborted convulsions and usually prevented death in white mice and rabbits given an ordinary lethal dose of isonipecaine (demerol). But when the dose of each barbiturate was increased to $\frac{1}{2}$ or $\frac{3}{4}$ of its respective LD 50 and $\frac{1}{8}$ to 1 LD 50 of isonipecaine was given, the animals died of respiratory depression, without convulsions. Diphenyl-hydantoin did not act like the barbiturates in the above respects. It is apparent that the isonipecaine-barbiturates antagonize the lethal convulsant effects of isonipecaine, but isonipecaine potentiates the depressive properties of the barbiturates on respiration.

L. E. GILSON (Chem. Abstr.).

Electrical Stimulation of the Vagi Increases the Narcotic Action of Magnesium Sulfate and Sodium Barbital. De Nito, Giuseppe (Univ. Naples). [*Boll. soc. ital. biol. sper.*, **15**, 1072-3 (1940).]

It has been shown previously that acetylcholine increases the narcotic action of $MgSO_4$ and Na barbital in rabbits. Electrical stimulation of both vagi in the neck has a similar effect, either through liberation of acetylcholine or by producing hypotension and decreasing the blood supply to the brain.

L. E. GILSON (Chem. Abstr.).

OBITUARY.

JOSEPH SHAW BOLTON.

PROFESSOR JOSEPH SHAW BOLTON, a Past-President of the Royal Medico-Psychological Association, died on November 12, 1946, at his home in Beaconsfield, where he had settled in 1933 on his retirement from the Chair of Psychiatry at Leeds University and the Medical Directorship of Wakefield Mental Hospital.

In the days when the cause of mental disorder was sought in the histopathology of the brain he was one of the most distinguished figures in British psychiatry, and in that sphere he deservedly had an international reputation. His work on localization of cerebral function by his own extremely delicate technique of micrometric measurement of the cortical cell laminae was a magnificent and most painstaking research, the fruits of which, perhaps, have not yet all been gathered.

His book, *The Brain in Health and Disease*, was published in 1914, when cerebral physiology was waning and interest was turning to the psychological approach; but there are signs that the needs of modern neuro-surgery may yet direct our studies back to Bolton's teaching.

Somewhat belated corroboration of his work appeared recently in this journal (October, 1946) in an epitome of "Recent Advances in the Study of the Brain as the Implement of the Mind":

"A theory of brain function is advanced according to which the cortex is divided into three functionally discrete layers: (1) The infragranular cortex is assumed to mediate the function of instinctual activities; (2) the granular cortex has a receptive function; and (3) the supragranular layer is the locus of control, inhibition and educability."

Thirty-three years ago Bolton wrote and elaborately proved—

"The cerebral cortex consists of three primary cell laminae: (1) the outer or pyramidal, (2) the middle or granule, and (3) the inner or polymorphic.

"The outer or pyramidal cell lamina is the cortex which subserves the associative, psychic, or educative, in contradistinction to the organic and instinctive function of the cerebrum. The latter are subserved by the inner cell-lamina, whereas the receptive functions are performed by the middle cell-lamina."

A main point of this research was a convincing demonstration of the association of sub-evolution of the outer or pyramidal layer of the prefrontal cortex with mental deficiency and certain psychotic syndromes.

Born at Whitby, Yorkshire, in 1867, Shaw Bolton began his medical training as an apprentice to a local doctor, and only after he had amassed a bank balance of £100, from such remunerative activities as coaching backward students and playing the organ in church, did his father, the late Isaac Bolton, give his approval to his sojourn at University College and University College Hospital. Already he had taken his B.Sc., and after a brilliant course as medical student he graduated M.B., B.S. Lond., with honours and gold medal in 1894, and one year later took his M.D. He won the Atchison Scholarship and Filliter Exhibition and was a Fellow of University College. His post-graduate academic record speaks for itself: M.R.C.P., 1902; F.R.C.P., 1909; D.Sc.Lond., 1912; Goulstonian Lecturer, 1910; Maudsley Lecturer, 1925; President, The Royal Medico-Psychological Association, 1928; Henderson Trust Lecturer, 1933; Emeritus Professor and Honorary D.Sc., Leeds, 1934; Lumleian Lecturer, 1935.

After some years in teaching and research, first in anatomy and then in physiology, he entered the service of the London County Council as a pathologist under the late Sir Frederick Mott, at Claybury. Subsequently he served on the staff of Hellingley and Rainhill Mental Hospitals, and in 1910 he succeeded Dr. Bevan Lewis as Medical Superintendent at Wakefield.

His energy was boundless, and the general tempo of his working hours was quite extraordinary. Despite his continued devotion to scientific medicine, he suc-

ceeded in keeping *au fait* with the work of every department of his large institution. His daily routine began at 8 a.m., and the morning interviews and correspondence were models of courteous alacrity and dispatch. It was thus that he was able to find time to spend both in his wards and his laboratory, and at the same time to be a recognized expert on poultry breeding, photography and radiology.

He was a great chief and a great friend, with a higher standard for his own conduct than that which he required from others. It is twenty-four years since the writer served under him, yet to-day he is aware of being conditioned in his reactions by Bolton's influence, and many of his former colleagues, now widely dispersed in the practice of psychiatry, gladly bear similar witness. He shunned publicity and social prominence, but a great unselfishness and generosity of spirit adorned his private life, and in his delightfully happy family circle he was the most genial and hospitable host.

Even after he left Wakefield his active work was not over, for he was asked and agreed to take over for a time the direction of the Bucks County Mental Hospital, where he carried out much needed re-organization until the appointment of the present Medical Superintendent.

For many months he suffered much and very patiently in a protracted illness, in which he was heroically nursed day and night by his devoted wife, who, with two sons and a daughter, survives him.

J. IVISON RUSSELL.